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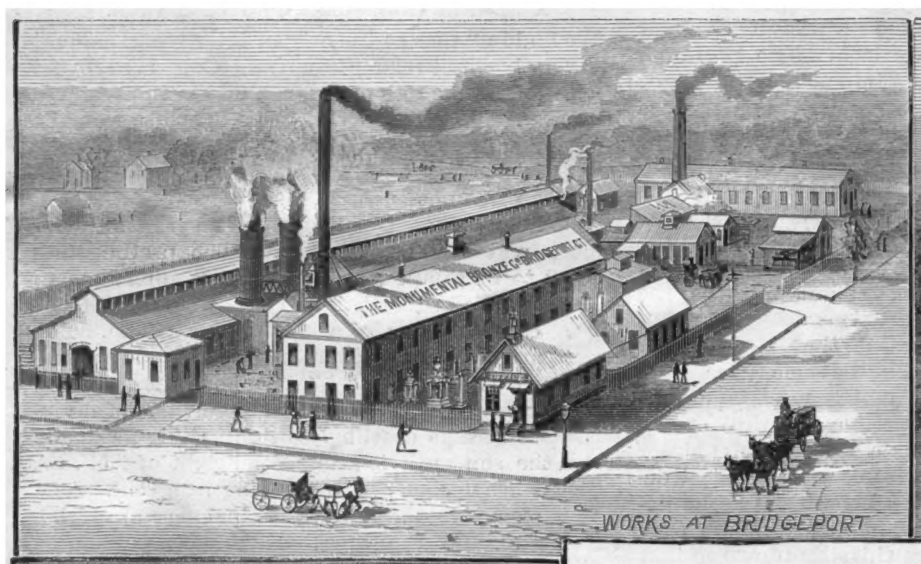

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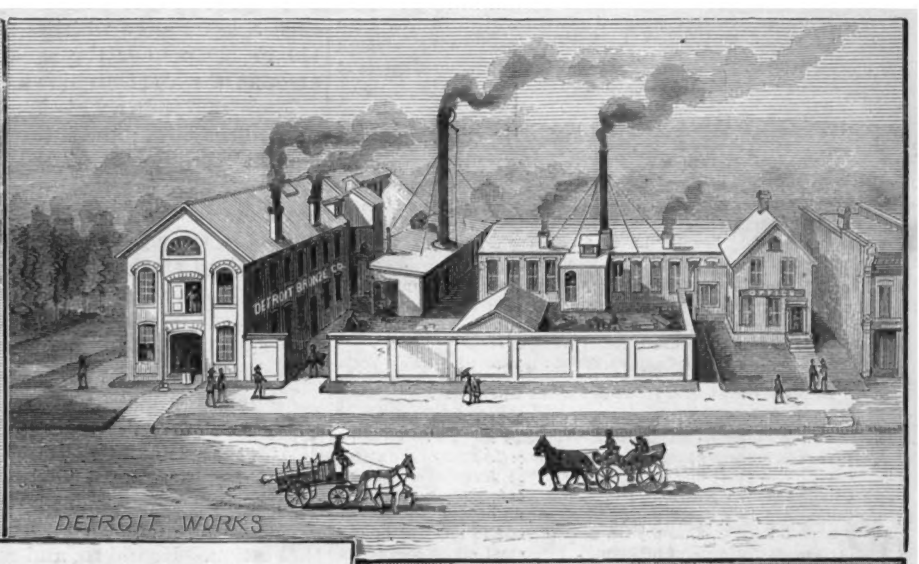

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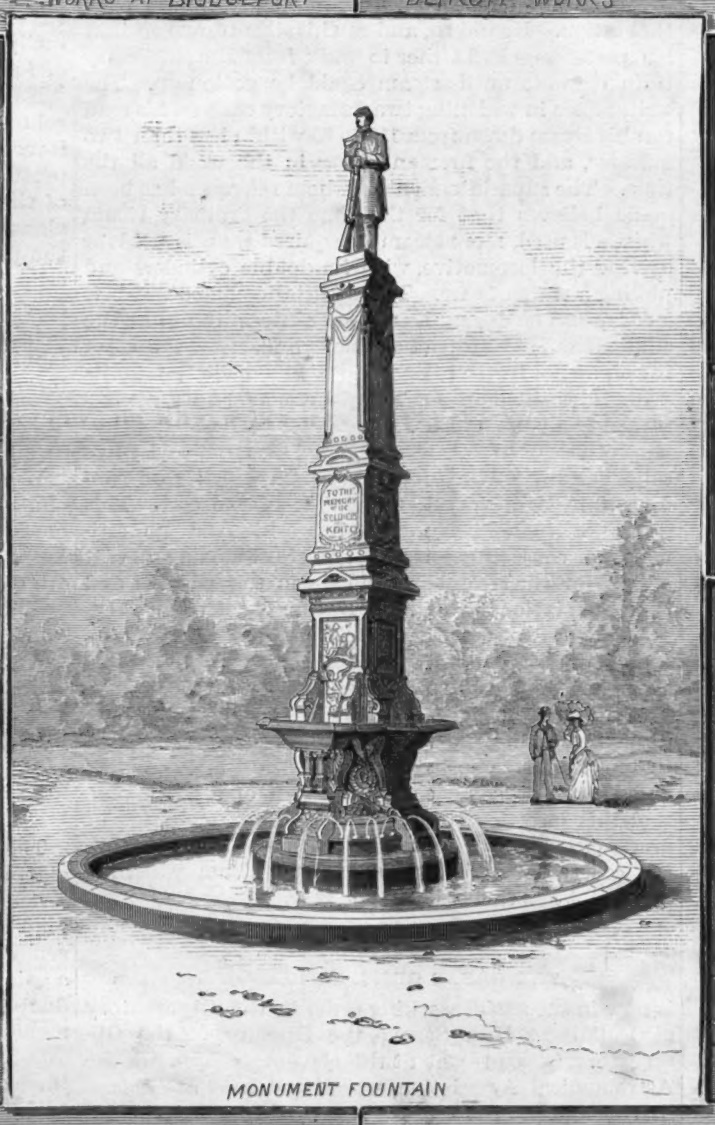
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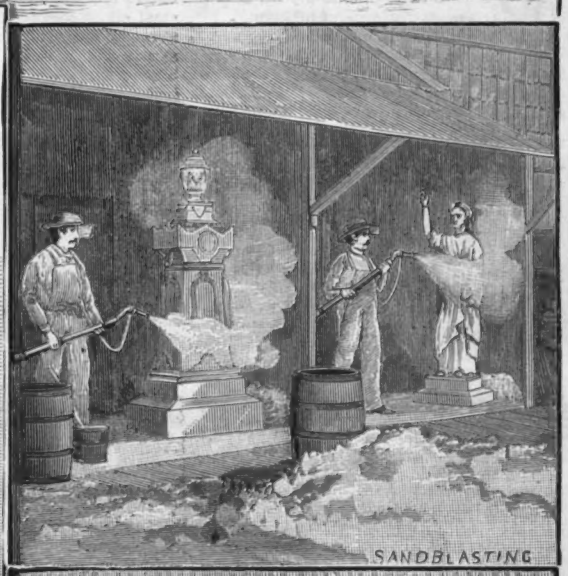
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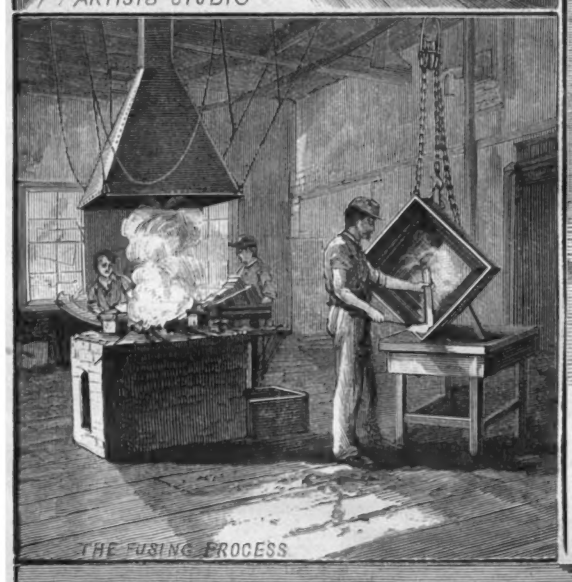
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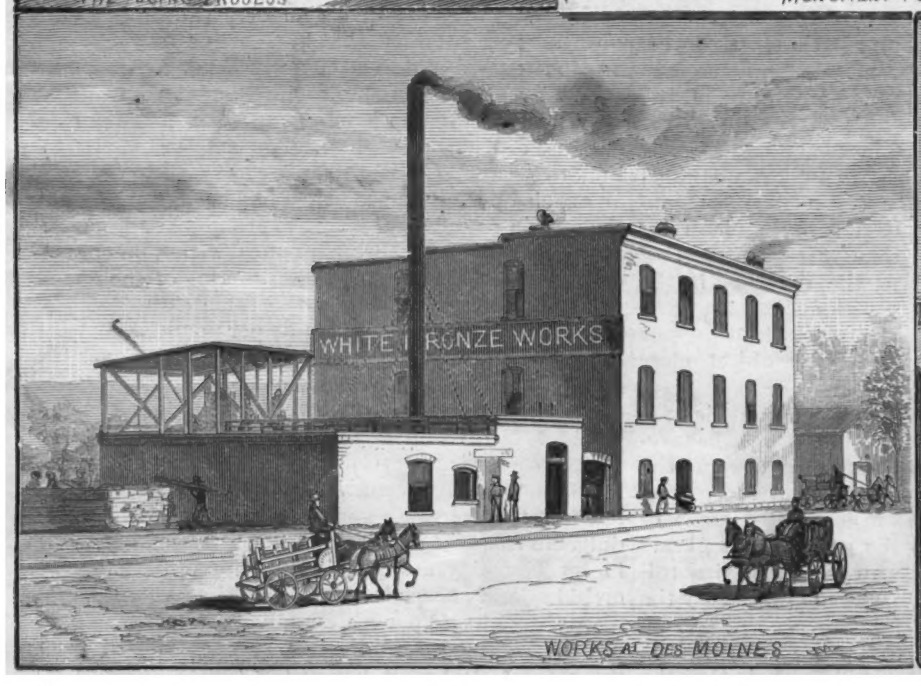

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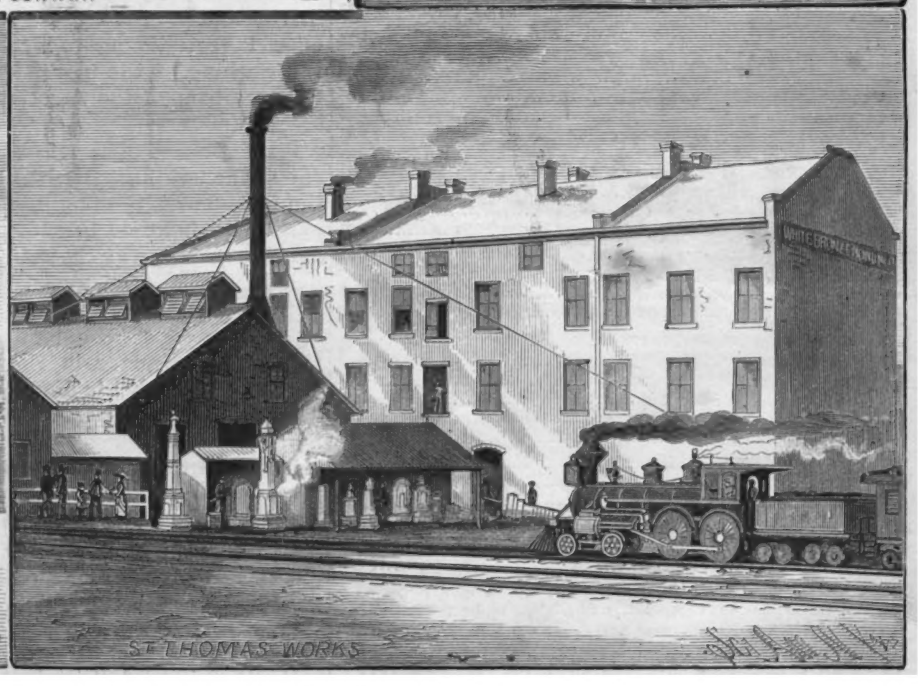
ST. THOMAS WORKS

ILLUSTRATIONS OF THE WHITE BRONZE MONUMENT INDUSTRY.—[See page 309.]

Scientific American.

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NEW YORK, SATURDAY, NOVEMBER 14, 1885.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 515,

For the Week Ending November 14, 1885.

Price 10 cents. For sale by all newsdealers.

THE WASTE OF WHISTLING.

The nuisance of the steam whistle in populated neighborhoods has been frequently mentioned, and in some localities municipal ordinances and railroad managements have restricted its use. But it is seldom that the cost, expense, and waste of the steam whistle is mentioned. And yet the blowing off of steam through locomotive whistles alone must entail an enormous waste of fuel. Steamboat whistles and the utterly useless stationary engine whistles must make, in the aggregate, an enormous waste to the purchasers of fuel for steam boilers. From recent reports it is seen that there are 1,940 grade crossings in the two States of New Hampshire and Connecticut. Probably not less than an average of twelve trains cross these roads daily; at each a locomotive whistles under a pressure of about 110 to 120 pounds the square inch. The aggregate amount of steam thus blown off into noise is very great.

The steam from a whistle escapes in an annular space around the bowl; and if the whistle is six inches diameter and the annular space is only one thirty-second of an inch wide, the total escaping space will be more than one-half square inch. That much steam is required to supply a steam whistle is evident from the fact that all steam whistles have for their connecting stems very generous steam pipes; and also from the fact, patent to every observer, that as dense a cloud of vapor is formed from the steam of the whistle as that escaping from the safety valve in the same time.

The superintendent of one of the most important railroads in the country, himself a practical engine driver, says that when he was a locomotive engineer he was requested by a committee of local political demonstration to persistently toot his whistle as he approached the depot from a point nearly a mile from the station. He did so, and ran his steam down so that his passengers had either to walk from the stationary train or wait until steam could be gotten up. The writer once in whistling two refractory oxen off his road ran his steam down from 110 to 80 within less than two minutes, and the fireman piling in the wood all the time. The superintendent to whom reference has been made believes that for the time the ordinary steam whistle is used, more steam is required than is used for driving the locomotive, with its double cylinders and pulling a train of cars. The whistle demand of steam is a constant one during its use—not intermittent like the admission of steam to an engine cylinder; and the size of the pipe—not less than one and a half inches—permits a very large amount of steam to escape under a pressure of 120 pounds to the square inch. This authority, with others of practical knowledge, says that thirty-five cents per day for the tooting of steam whistles on running trains is a very low estimate of the cost. This does not include depot yard work. And no estimation is conjectured as to the waste of steam and cost of fuel for the steamboat and steam tug whistles and those of stationary boilers. But for exactive legal enactment and obstructive legalized orders, much of the useless waste of whistling, and much of its abominable annoyance, could be stopped and abated.

A still more exact statement is that of a well informed railroad man, who says that the expenditure of fuel for each locomotive on the New York, New Haven, and Hartford road each day is about one-eighth of a ton; this only for the legally required soundings at grade crossings. This would make, for this one road, the cost of fuel, for grade crossing steam whistling alone, not less than $15,000 per year.

ASTRONOMICAL NOTES.

THE GREAT RUSSIAN TELESCOPE

is now in successful working order in the Observatory at Pulkowa. Herr Struve, the Director of the Observatory, was present at the eleventh meeting of the Astronomical Association, which was held at Geneva in the month of August. The distinguished astronomer bore testimony to his complete satisfaction with the working of the new telescope. He presented to the members of the Association photographs of the great refractor.

Professor Newcomb, of Washington, was also present at the meeting. He had been at Pulkowa, studied the instrument thoroughly for seven days continuously, and indorsed heartily Herr Struve's views regarding it, giving at the same time various interesting details. It is to be hoped that the telescope in the hands of so efficient a director will distinguish itself by making some brilliant discovery. It is at present the largest refractor in the world, the object glass being thirty inches in diameter.

The glass was prepared by Messrs. Alvan Clark & Sons, of Cambridgeport. Mr. Alvan Clark has received from the Czar of Russia gratifying proof of the appreciation of his work. It took form in the golden honorary medal of the empire "in acknowledgment of the excellent performances of the great object glass." The medal is given very rarely, and only for extraordinary merits. Only one other has been granted by the present Emperor.

THE AUGUST METEORS.

Mr. Denning, of Bristol, England, reports that the shower was more brilliant than usual, although he made no regular observations, on account of the overcast sky. Many meteors were, however, noticed in the clear spaces that occasionally occurred, and the display must have been a fine one, judging from the numbers visible in the small portion of the heavens available for observation. The August meteors are known as Perseids, because they radiate from a point in the constellation Perseus. On the nights of August 5, 8, and 13, thirty-seven Perseids were seen, though cloudy weather prevented a full observation. The shower continued until the 20th, though it was a very slight shower at the last, two Perseids only being seen in a watch of three hours and a half, when thirty-one meteors were recorded.

A REMARKABLE SOLAR PROTUBERANCE.

We find in "Ciel et Terre" an interesting account of a very brilliant solar protuberance, observed by M. Trouvelot, on the 16th of August, on the sun's eastern border. At first it appeared to be detached from the sun, and seemed to float above the solar surface like clouds in our atmosphere. Closer attention showed that such was not the case, but that it was attached to the chromosphere by a long and slender filament, inclined, and slightly luminous. The protuberance seemed to be composed of a single branching filament folded or rolled several times upon itself, thus forming a compact mass of a hemispherical form. The lower part extended 2′ 36″ from the sun, and the summit reached a height of 3′ 54″. An hour later, the protuberance, at first quiescent, showed signs of movement. It became dazzlingly bright, rising gradually above the sun until it attained a height of 4′ 51″. A curious phenomenon occurred during its ascent. As it rose it seemed to unroll, the principal mass appearing to unwind, and the branches first seen remaining easily recognized on the column, in spite of the changes of form it had undergone.

Half an hour later, it formed a long, branching column, brighter at the summit than at the base. As it rose, its luster dimmed. This is usually the case with protuberances that rise above the sun. At the end of the observation it was so faint that the summit alone was visible. A faint idea may thus be gained of the pent-up forces existing in the solar mass, when eruptions of flaming hydrogen take place like the one described. The tongues of flame must have reached a height of nearly 130,000 miles above the solar surface, moving with an amazing velocity, changing form with incredible rapidity, and beginning and ending during an observation of about two hours.

ASTEROIDS.

We have already recorded the advent of five asteroids in 1885, the last ranking as No. 249. Three new ones have since been added to the list. Dr. Palisa, of Vienna, won the honor of discovering No. 250 on the 4th of September. Dr. Palisa also discovered No. 251 on the 4th of October, thus raising the number of those found by him to forty-nine. Dr. Perrotin is latest in the field, announcing the discovery of No. 252 on the 28th of October. Thus far the three latest comers remain unnamed. It is becoming difficult to find names for this numerous family.

Percentage.

The reckoning of percentages, like the minus sign in algebra, is a constant stumbling block to the novice. Even experienced newspaper writers often become muddled when they attempt to speak of it. The ascending scale is easy enough: Five added to twenty is a gain of 25 per cent; given any sum of figures, the doubling of it is an addition of 100 per cent. But the moment the change is a decreasing calculation, the inexperienced mathematician betrays himself, and even the expert is apt to stumble or go astray. An advance from twenty to twenty-five is an increase of 25 per cent; but the reverse of this, that is, a decline from twenty-five to twenty, is a decrease of only 20 per cent. There are many persons, otherwise intelligent, who cannot see why the reduction of one hundred to fifty is not a decrease of 100 per cent, if an advance from fifty to one hundred is an increase of 100 per cent. The other day an article of merchandise which had been purchased at ten cents a pound was resold at thirty cents a pound, a profit of 200 per cent; whereupon a writer, in chronicling the sale, said that at the beginning of the recent depression several invoices of the same class of goods, which had cost over thirty cents per pound, had been finally sold at ten cents per pound, a loss of over 200 per cent. Of course there cannot be a decrease or loss of more than 100 per cent, because this wipes out the whole of the investment. An advance from ten to thirty is a gain of 200 per cent; a decline from thirty to ten is a loss of only 66 2-3 per cent. The New York *Sun* prides itself on the exactness and purity of its style, and indulges in frequent criticisms of its contemporaries; but in its Thursday morning's description of the great orchid sale, it affirms that "some of the highest priced plants brought 150 per cent less than Mrs. Morgan paid for them." Of course, if nothing was realized from them, this would only be 100 per cent less than they cost.—*Journal of Commerce.*

Zincography.

Mr. Mantel, director of the stereotype foundry of Dupont's printing house, describes as follows the process of converting a lithographic or copper plate print into a typographic block. The composition to be reproduced is drawn with a crayon or pen upon a lithographic stone, which undergoes all the preparation necessary for a proof upon transfer paper. It is then transferred to a plate of properly planed zinc, which has been washed with a solution of soda or potassa and dried with a rag. The transfer is made just as if it were a question of an impression upon stone. Care is taken to see that the fine lines of the drawing are all reproduced, and, if they are satisfactory, gum water, alone or with the addition of a decoction of nutgalls, is passed over the surface of the zinc. The gum combines with the zinc, and renders it proof against the contact of fatty matters.

After the plate has remained under gum for a little while, it is washed and then inked with thick ink by means of a lithographic roller, just as would be done for pulling a proof from stone. Then, by means of a cotton dabber, resin in impalpable powder is dusted over the entire surface—although finely powdered bitumen may likewise be used This resinous dust adheres to the oily parts, solidifies them, lodges in all the interstices formed where the inking has been slight, and forms a protecting envelope against the penetration of the acid. Care is taken to remove all the superfluous resin.

The edges and bottom of the plate are now covered with lac varnish or a solution of bitumen, after which it is immersed in a bath of water containing five per cent of nitric acid. After remaining in this for twenty minutes, it is taken out and gently rubbed with a piece of soft charcoal—an operation which, by removing the first layer of ink, allows the beginning of the conversion of the drawing into a typographic plate to be seen.

This first biting in is usually very slight. If it has proceeded regularly, a second inking is given before immersing the plate in the bath again for another twenty minutes. Upon being taken out the second time the ink is removed as before, and the plate is examined to see whether the acid has done its duty. Then a third inking is given, and the plate is immersed again for from twenty to twenty-five minutes.

At every biting in, the strength of the bath is increased two or three degrees by the acetometer. It is rarely the case that a fourth biting in is necessary. The trough containing the bath is of oak lined with either gutta percha or sheet lead. It is fixed upon a pivot that allows it to be given a continuous rocking motion while the plate is immersed. This agitation is indispensable in order that the acidulated water shall constantly flow over the plate and carry away the salts of zinc that are formed.

The transfer of the drawing from stone to the zinc plate is affected in a lithographic press. Only line drawings are treated by this process.

The zinc plates are prepared by specialists. Moreover, if it be desired to write, draw, or make a transfer upon a zinc plate, it is essential that the latter shall undergo various preparations, such as polishing, scouring, etc. If these operations have been properly performed there will be obtained good typographic plates that it will be only necessary to mount upon wood after the whites have been routed out. Finally, the blisters are removed with a graver, all the inequalities are straightened out, and all the small defects observed are remedied. As for typographic plates derived from an engraving on steel or copper, instead of making a drawing upon stone, the engraving is transferred thereto, and from this is pulled a proof upon India paper, which is transferred to the zinc plate.—*Chronique Industrielle.*

American Shipping.

The Maritime Exchange of New York city recently met to take action on the report of a special committee appointed to suggest a plan for the revival of the merchant marine. The committee was in favor of Congress enacting a law, based on the French bounty act, by which all steam and sailing vessels built in the United States and in the merchant service should be entitled to a bounty of 30 cents per ton for every 1,000 miles sailed. It also suggested that the bounty continue in force for ten years, and that at the end of that time the amount be reduced ten per cent each year. The wording of the suggestion is a trifle ambiguous. The Exchange, having had its purpose strengthened by favorable communications from Philadelphia, Boston, and San Francisco, and from the Commissioner of Navigation, passed a resolution instructing the committee to draw up a bill to be introduced into the next Congress.

At the present time the shipping business is greatly depressed in all parts of the world. In this country many vessels are idle, tied up to the docks, no cargoes to carry. In England hundreds of steamships are laid up, the ship building industry is greatly reduced, and thousands of workmen thrown out of employ. An additional act of Congress that would bring business for our present fleet would not be a bad project.

PHOTOGRAPHIC NOTES.

Graphic Method of Determining the Speed of Shutters.—Prof. L. H. Laudy, of the Columbia College School of Mines, in this city, recently exhibited before the Society of Amateur Photographers a simple apparatus for showing the speed of shutters. It consisted of nothing more than a common tuning fork, which can be purchased for five dollars, having fastened at one end, by glue or cement, a fine delicate style or hair. Upon the outside surface of the shutter was secured a narrow strip of glass, mica, or other transparent, smooth material, by means of four or five drops of melted paraffine. The exposed surface of the glass was smeared with lampblack, obtained by holding the glass over a candle or smoking lamp before adhering it to the shutter.

The lens, with the shutter set, is next placed in front of the tuning fork in proximity to the delicate style on the end, so that the same gently scrapes against the glass strip. With a common violin bow, vibration is imparted rapidly to the tuning fork, and immediately the shutter is made to fall, carrying along with it the glass strip. Taking the glass strip off of the shutter afterward, and examining it by transmitted light, a fine wavy transparent line is seen, the length of each wave increasing as the speed of the shutter was accelerated.

Knowing that the fork makes a certain number of vibrations per second, it is easy to count the different waves on the glass, and thereby determine accurately the time it took the shutter to fall.

When it was desired to maintain a constant vibration in the fork, a battery was provided which, by means of a make and break current, operated a magnet alternately. By careful experiment it was proved that the friction of the delicate style on the glass surface did not in any way affect the vibration of the fork. An ordinary gravity shutter was found to fall in about one-twelfth of a second.

Prof. Laudy stated that Mr. Muybridge, experimenting for the University of Pennsylvania, had succeeded in making a shutter which would operate in the one five-hundredth part of a second. He believed this was the fastest speed yet attained.

The advantage of the tuning fork method over the ordinary chronograph for recording the speed of shutters was its cheapness.

Specimen strips of glass made by operating the shutters of different speeds before the audience were immediately thrown upon the screen by the optical lantern, showing very plainly the remarkable simplicity and advantage of this graphic method. Some of the shutters, with two or three elastics attached, went off with a report as loud as a pistol.

Toning Lantern Slides.-The following useful method for imparting rich blue-purple tones to lantern slides was recently given by Mr. Ayres before the London and Provincial Photographic Association in a report in the *British Journal of Photography.*

He used bichloride of platinum, and could obtain a blue tone, and reduce any shadows which might be too heavy. Three baths were made, as follows:

No. 1.

Water	10 ounces.
Bichloride of platinum	2 grains.

No. 2.

Water	10 ounces.
Chloride of gold	2 grains.

No. 3.

No. 1	1 ounce.
No. 2	1 ounce.

It will be seen that No. 3 is a mixture in equal parts of No. 1 and No. 2. When the shadows of the slide looked too dense and heavy, he put it into No. 1; if, on removing, it then looked too cold in tone, he put it in No. 2 to warm it up. If he doubted whether it wanted warming up, he put it in No. 3. By means of the three baths he had the transparency under complete control, and had no difficulty in turning out good slides. He stated that the plan would do for prints on gelatine as well as on collodion.

With iron development and slow gelatine plates, the tone obtained after fixing is usually a chocolate brown; after well washing, the plate is treated as above stated, when the blue tone is produced.

Bachrach's Method of Developing in Two Solutions.—For the past eighteen months the following plan has been in successful use:

No. 1.

Boiling water	16 ounces.
Crystallized sulphite soda	3 ounces.
Schering's recrystallized pyrogallic acid	1 ounce.
Sulphate of soda	¼ ounce.

To the above add:

Salicylic acid	5 grains.

Dissolved in

Alcohol	1 drachm.
Glycerine	¼ ounce.

This solution will keep for months, and may be held in an ordinary covered dipping bath similar to that formerly used to hold the silver bath.

No. 2.

Crystallized carbonate of soda	½ ounce.
Crystallized sulphite of soda	1 ounce.
Water	12 ounces.

The plate is dipped in No. 1 for from a half to one minute, then removed and put into a developing tray containing sufficient of No. 2 to cover the plate. Should the plate be overexposed, a suitable restrainer is added to No. 2.

The plan of procedure is to develop the plates which are thought to be underexposed first, and finish with those fully timed, as it is found No. 2 acquires a little pyro from the plates.

The development of large batches of plates by this plan is not only rapid and economical, but also remarkably uniform in density and color.

With the whole amount of the No. 1 solution, two persons (one to dip in No. 1 and the other to develop) have frequently developed twenty-five 8x10 plates in half an hour, with results much more even and satisfactory than with the usual method.

The function of the addition of the sulphate of soda to No. 1 is to prevent the solution from attacking or softening the gelatine film, especially when plates are used prepared with a soft gelatine.

The Preservation of the Obelisk.

The New York Park Commissioners are taking the preliminary steps toward the protection of the obelisk in Central Park. They have decided to employ a paraffine process suggested by Prof. Doremus, and known as the Caffall patent process. The shaft is first gone over very carefully, and every loose particle removed from its surface. This is the most tedious part of the whole undertaking, but is considered absolutely necessary for a thorough treatment. The erection of the scaffolding required some little time, as it had to be built entirely independent of the monolith.

After this scraping, the surface of the stone, when thoroughly dry, is heated to a temperature slightly exceeding the melting point of the waterproofing mixture, about 140° F., by means of a series of small charcoal furnaces suspended from the scaffolding. The waterproofing mixture consists of paraffine, creosote, and turpentine, and is prepared as follows: One part by weight of creosote is mixed with five parts of turpentine, and the mixture boiled until clear. Twenty-five parts of paraffine are then added, and the whole brought almost to ebullition. The hot liquid is applied to the heated surface of the stone, and is absorbed to a depth of one or two inches, depending upon the depth to which the stone is heated. After treatment, the surface is hard and waterproof, the only visible effect being a darkening of the color. This, however, will improve the appearance of the monolith, as the syenite was originally darker than at present. The work will probably be completed some time during November, and is expected to cost about $550.

We publish on another page an interesting letter from a correspondent in Nashville, Tenn., who gives the results of practical experience in preserving stone structures.

The Explosion of Dynamite.

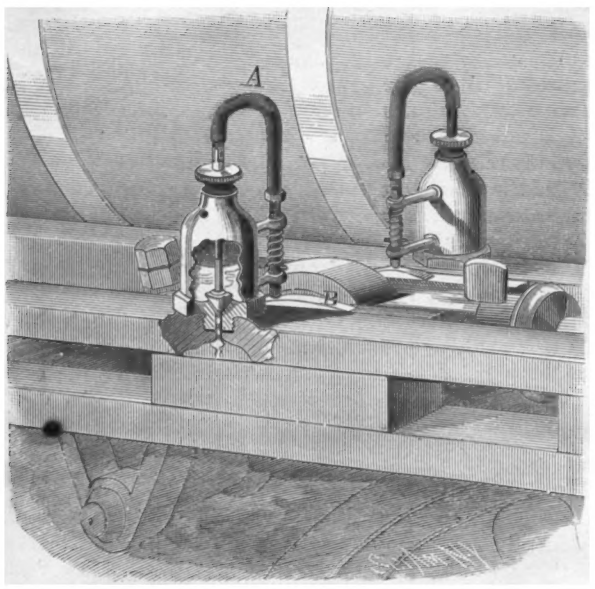
The chronoscope of Captain Noble showed that explosion is transmitted through trains of dynamite at the rate of 20,000 to 24,000 feet per second. At this rate the explosion of a cartridge a foot long must only occupy the 24,000th part of a second. A ton of dynamite cartridges of the usual size, about ⅞ inch in diameter, laid end to end in a line, would stretch a mile, and the whole train could be exploded in the one-fourth part of a second by firing a cartridge at either of the ends. If fired in the middle of the line, the explosion would be transmitted both ways, and would occupy only the eighth part of a second. The facility with which dynamite can be fired in trains offers great advantage in many engineering operations, such as where it is required to blow down an arch or a wall. It is enough to lay a train of cartridges along the crown of the arch, or along the bottom of the wall, and explode one cartridge in the usual way with a detonator. The whole train goes off instantly. The enormous velocity with which dynamite explodes explains the great violence of its action, and the tremendous local rupturing effects of even small quantities of it exploded in the open, and without being inclosed in a case of any kind. The detonation of a cartridge in the 24,000th part of a second must produce an enormous instantaneous pressure on the spot on which it explodes. For such a sudden explosion the pressure of the atmosphere itself is sufficient tamping.

Wind on Lake Erie.

During the prevalence of a strong east wind, the waters of Lake Erie were recently lowered two feet at the eastern end of the lake, and the work of loading boats in the Blackwell Canal had to be suspended. At Toledo the wind blew such a gale at the same time, but from the west, that the Maumee River dropped two feet below the accustomed level, and a steam barge could not leave port on account of low water. The two currents met in the lake off Port Stanley, Ont., and produced a noticeable elevation of the waters. Such an occurrence has never been known before on the lakes.

IMPROVED OIL CUP.

The engraving represents an invention lately patented by Mr. Albert L. Swift, of 716 Dakotah Street, Leavenworth, Kas., relating to that class of self-feeding oil cups in which the spindle may be adjusted for

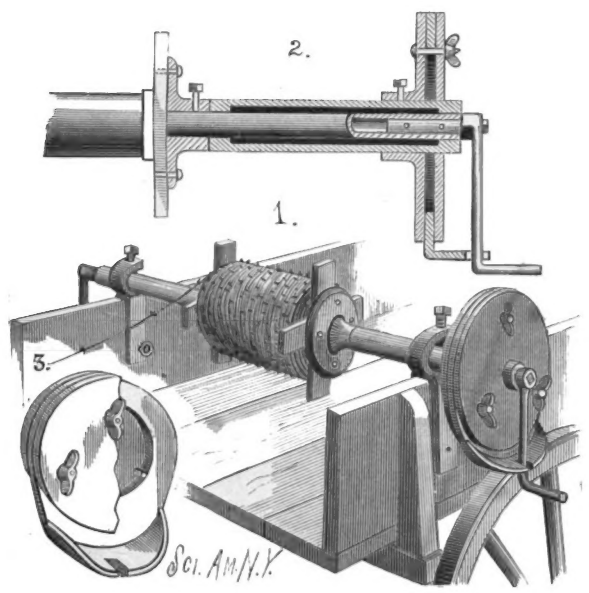


SWIFT'S IMPROVED OIL CUP.

regulating the flow of oil. The oil reservoir is formed with a screw-threaded shank, by which it is secured to the bearing for oiling the shaft, or to the bar for oiling a crosshead. The outlet is adapted to be closed by a spindle having a head formed as shown in the cut; the stem passes through a screw plug in the top of the reservoir, and its upper end is connected by a screw-threaded link with a curved rod, A. To the opposite end of the curved rod is attached a rod held loosely in keepers, and of such length, compared with the spindle, as to reach to the shaft or crosshead. A coiled spring is so arranged as to press the rod downward, so that the head of the spindle will normally close the outlet, and prevent the passage of oil from the reservoir to the bearing. Upon the shaft or crosshead, in line with the rod, is a small cam, B, that serves to lift the rod and its connections, as the shaft revolves or the crosshead reciprocates, to permit the escape of oil. A regular feed of oil is thus obtained while the machinery is in motion, and there is no drip or loss while the machinery is quiet. The reciprocating motion of the spindle keeps the oil from hardening in cold weather, and very heavy oil may be used, as the head will force it through the outlet. By means of the screw connection, the amount of oil fed may be regulated. It will be seen that the parts are simple, and may be durably constructed.

PORTABLE WIRE REEL.

The accompanying engraving represents a portable wire reel which facilitates the unwinding of fence wire,



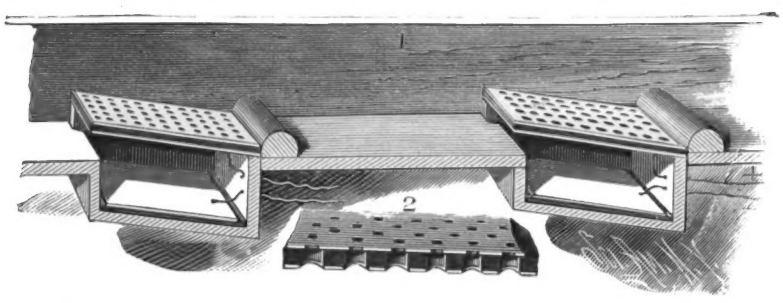
ROBERTS' PORTABLE WIRE REEL.

either barbed or plain, from spools, and winding it thereon in putting up and taking down wire fences. The reel can be readily and securely attached to the boxes of wagons or other vehicles. Upon the ends of a tubular shaft are detachable cranks held in place by nuts. Upon opposite sides of, and equally distant from, the center of the shaft are secured two flange collars, one being permanently secured; the other is loose upon the shaft, and is held in place by a set screw. Between the collars is placed one of the spools upon which fence wires are wound when sent to market. The spool is secured to the collars, so that it will be revolved by them. Upon the end parts of the shaft, between the collars and cranks, are placed sleeves, which may have bearing boxes in their ends to lessen the friction (as shown in the sectional view, Fig. 2), and which are designed to serve as handles in holding and carrying the reel and as guards to prevent the clothes of the operators from being injured by the revolving shaft. With this method of construction, the collar secured by the set screw, and the sleeve and crank at that end of the shaft, can be readily detached to allow a spool to be put on or taken off. Near the outer end of one of the sleeves is secured a flanged collar (shown in place in Figs. 1 and 2, detached in Fig. 3), which carries an annular disk held in place by bolts provided with hand nuts. Between the flanged collar and annular disk is placed a second disk resting and revolving upon the bolts. One side of the second disk carries a laterally projecting flange tapered from its middle part toward the ends, and formed with a central recess, as shown, so that the crank will carry the disk with it in its revolution. By tightening or loosening the nuts of the bolts, the disk will be put under more or less friction, so that any desired tautness can be given to the wire as it runs off the spool. Set screws hold hooks to the sleeves; the shanks of the hooks are forked to receive the side boards of the wagon box, and are perforated to receive pins by which the hooks are detachably held to the side boards.

This portable wire reel is the invention of Mr. David A. Roberts, of Creston, Ill

IMPROVED AMALGAMATOR.

This invention is designed to supply a want where fine mineral is lost from gold and silver mills, and also for use in places where the gold is "flour," and cannot be saved by ordinary means. Another use for which it is intended is the washing of tailings which will not pay for remilling, but which may have enough amalgam and quicksilver in them to yield a profitable return by sluicing large quantities through the amalgamator.



PIKE'S IMPROVED AMALGAMATOR.

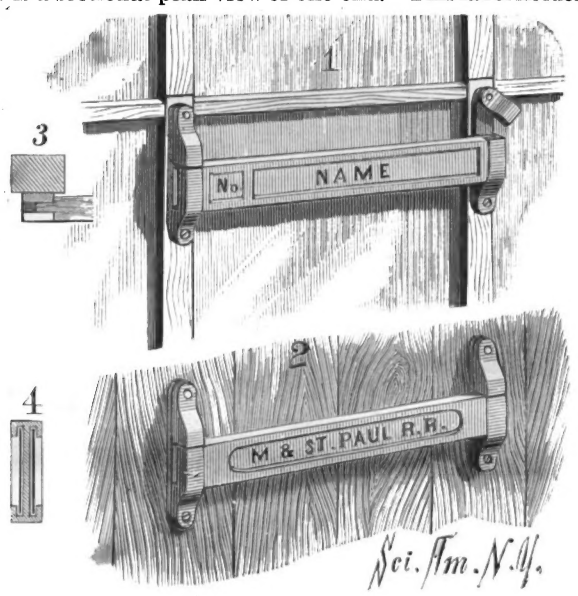
A feature of the amalgamator is its adaptability to heavy flumes where gold mining is carried on; the perforated plate—or grizzly, as the miners term it—protecting the working plate or bath of quicksilver below from the heavy gravel or rocks which come down, while the finer stuff is sent through the perforations, and, by the force of the current, is worked into the main box again. The action of the water in passing through the box is such that the finest particles of mineral must come in contact with the amalgamating surface below, while the force of the current is strong enough to prevent any "filling up."

When the two plates are connected with an electric battery—the lower plate being the negative, and the upper the positive—a current is formed, the ore and water passing through completing the circuit. This method has the advantage of confining the force of the electric current within the fixed box, the stream above and below not dissipating it. The application of electricity is simple and exceedingly effective in working on "rusty" gold, and in keeping the quicksilver bright and active for amalgamating.

The construction of this amalgamator, which is the invention of Mr. Edward Pike, of Salt Lake City, Utah, is so clearly shown in the cut as to need but little explanation. Immediately below each riffle is a quicksilver-tight box having an inclination the reverse of that of the flume. Above each of these boxes is a double perforated plate composed of duplicate plates of either copper or iron insulated from each other. In the bottom of each box is an insulated amalgamated copper plate. To these plates the wires are attached, as shown in the cut.

LABEL HOLDER.

This device is designed for holding labels on letter boxes, pigeon holes, etc., in such a way that the label can be easily removed, and at the same time cannot drop off or become detached. The metal case is formed with slots in the front and back, and a longitudinal upright partition, as shown in the sectional view, Fig. 4. The labels are slipped into the holder through end slits. When made as shown in Fig. 1, the number appears in the small slot and the name in the large one; this form is designed for letter boxes. In Fig. 2 the names only appear, one on each side of the holder, thus adapting it to be reversed; this holder is intended for use on railway mail cars. The holder is held at each end in a bracket secured on the front of the box or pigeon hole. The bracket has an upwardly projecting prong on its front edge, forming a pocket for receiving the flat tenon on each end of the holder. The holder is held in place by a pivoted latch on the front of each bracket. Fig. 3 is a sectional plan view of one end. This label holder

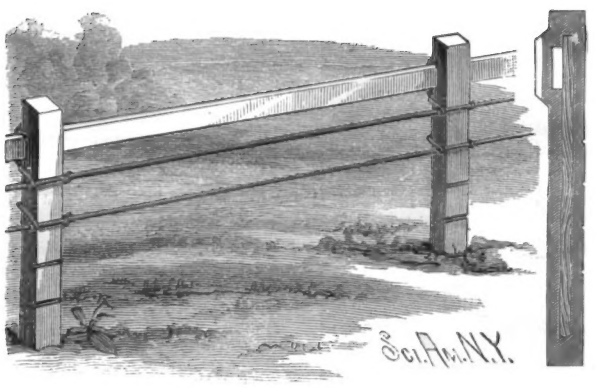


CANNON'S LABEL HOLDER.

—the invention of Mr. Edward A. Cannon, of Pensaukee, Wis.—can be easily placed in or removed from the brackets.

A FENCE POST OF ARTIFICIAL STONE AND WOOD.

A most substantial fence post, and one not liable to be affected by the weather or deteriorate with age, is shown in the accompanying illustration. It is made of cement or other artificial stone composition, formed around a core of wood or metal extending to within a short distance of the ends of the posts, or even through the stone covering. In the back portion of the posts are pockets or mortises, as shown in the side view, for



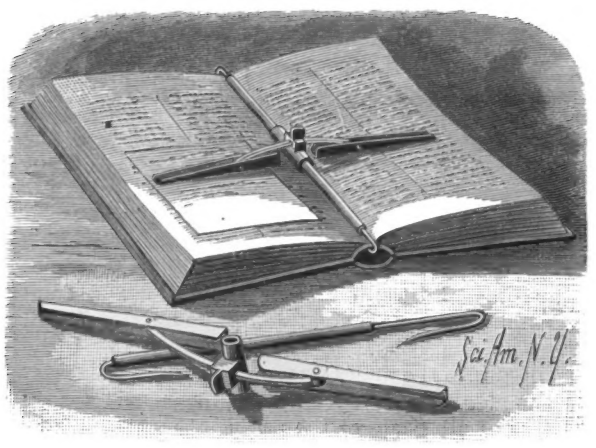
WHEELER'S IMPROVED FENCE POST.

receiving the ends of the top rail, where it is desired to have the lower portion of wire, or there may be enough more of these mortises to make a many-barred fence if desired. There are transverse grooves in the artificial stone to receive fence wires, to be held in place by wires passed around the post. The post may be made square, polygonal, or round, as preferred, the core preventing breakage from a blow or transverse strain, and keeping the post from falling to pieces if cracked, while the core itself is preserved by its covering from rot or decay.

This invention has been patented by Mr. Benjamin Wheeler, Jr., of Zanesville, O.

BOOK AND COPY HOLDER.

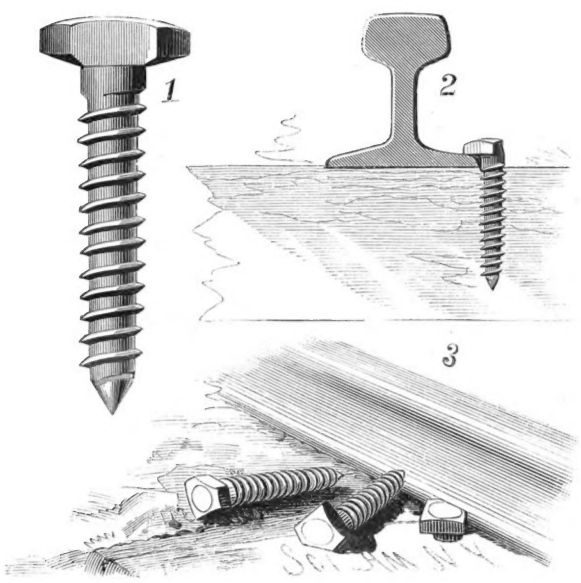
The engraving shows a very convenient and easily applied book and copy holder, invented by Mr. Amos Hockett, of Wilmington, Ohio, and the use of which greatly facilitates the copying of documents and access to the book. The general form of the holder and



HOCKETT'S BOOK AND COPY HOLDER.

the manner of applying it to a book are shown clearly in the cut. A tubular rod is provided at one end, with a suitable hook engaging the back binding of the book, and at the opposite end is a sliding hook,

the shank of which slides within the rod. The holder is composed of one or more wires attached to a thimble sliding upon the exterior of the rod; the outer ends of these wires are pivoted between the sides of bars which rest upon and hold the leaves down when the device is in place on the book. The holder proper may be shifted up or down the rod as desired, and manuscript to be copied may be held in convenient position by passing it between one of the holders and the face of the page. By means of the sliding hook, the holder can be adapted for books of different sizes.



HUNTINGTON'S IMPROVED RAILROAD SPIKE.

Large Vine.

The largest vine in the world is said to be one growing at Oys (Portugal), which has been in bearing since 1802. Its maximum yield was in 1864, in which year it produced a sufficient quantity of grapes to make 165 gallons of wine; in 1874, 146 1-3 gallons; and in 1884 only 79¼ gallons. It covers an area of 5,315 square feet, and the stem at the base measures 6½ feet in circumference.

IMPROVED PLATE ROLLING MACHINE.

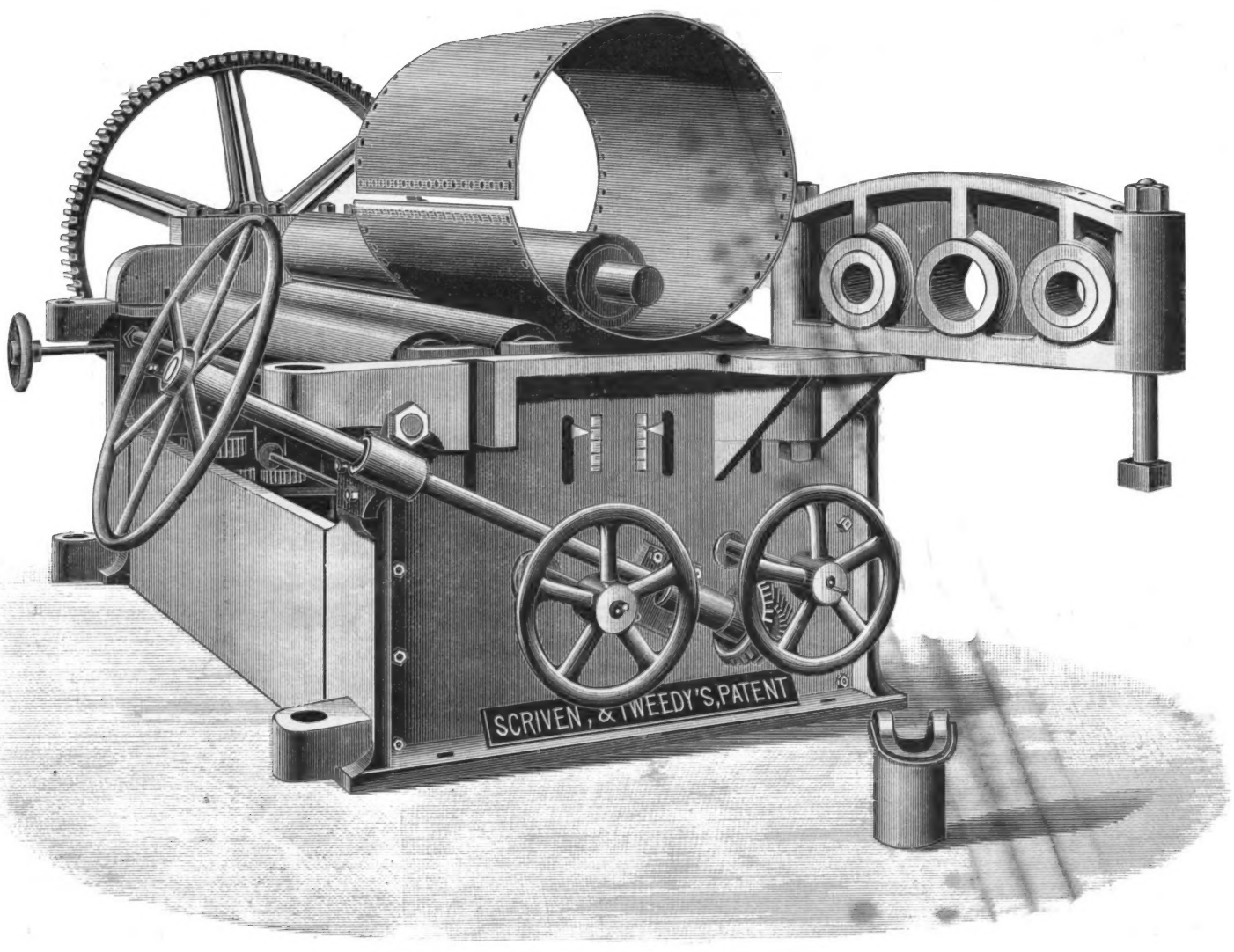
Scriven & Co., of Leeds, are now manufacturing a useful form of plate rolling machine, Scriven and Tweedy's patent. This machine is specially designed for light work and for shops where it is advisable to have a tool which may be adapted to various kinds of work. Its special features are the arrangement of the movable rollers below the fixed ones, and of a pivoted cheek. It may be used either for rolling flat plates or for bending for donkey boilers or masts and spars. It will be observed that any wear in the roller journals tends to bring the rollers together, instead of, as in the ordinary rolls, to let them drop apart. The common tendency to bending the end of the plate is thus obviated, as the lower rolls are adjusted to their level by hand. The general arrangement of the machine will be understood from the illustration.

When the machine is required for bending plates, the two outer top rollers are removed. The bushes of all the top rollers are fitted in sleeves; when these are withdrawn, the cheek is swung round, and the rollers lifted out by the cranes, fixed in snugs at the corners of the machine. It will be seen that tubes of any diameter can be rolled in this machine, and are easily removable by swinging back the cheek as described.

The lower rolls are susceptible of very fine adjustment by the hand wheel and screw gear, and a gauge is placed on the end of the machine to show the exact position of the rolls. The two outer rolls of the lower course are easily removed, if it is desired, to reduce the wear and tear when the machine is being used for small bending work. The guides for the four bottom rollers are so arranged that the bushes can readily be lifted out.

The change of the machine from a flat plate roller to a plate bender can be effected in fifteen minutes. A very important point about this machine is that it is entirely free from any obstruction above the rolls, leaving a clear space for the manipulation of the work. A number of these machines have now been sent out, and all are giving complete satisfaction.

Our illustration shows the machine with the two outer top rollers removed, and the machine prepared for cylindrical bending work.—*Mech. World.*



IMPROVED PLATE ROLLING MACHINE.

IMPROVED RAILROAD SPIKE.

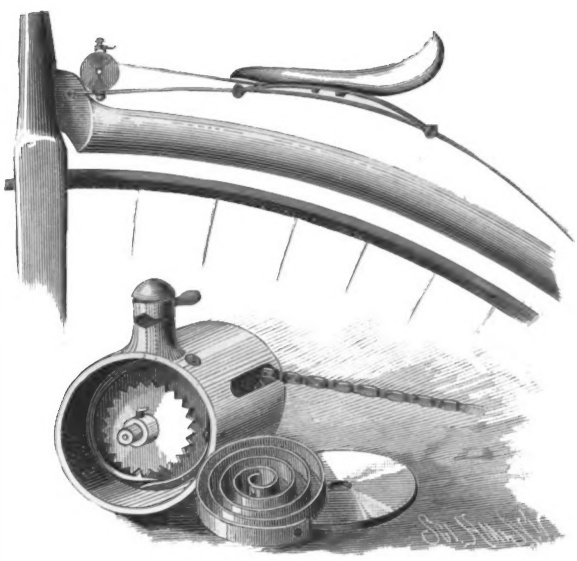
The object of the invention herewith illustrated is to produce a cheap, convenient, and effective rail fastening to take the place of the common spikes, which do not at all times hold the rails from spreading apart or tipping over, and to take the place of other fastenings which are too expensive for general use. The form of the spike is clearly shown in each of the figures. To remove the rails for repairs, etc., it is only necessary to give the screw half a turn to the left in order to bring the blank or flat side of the head to the rail, as shown in Fig. 3. The rail can be readily replaced and fastened by simply turning the screw back to place (as shown in Fig. 2), which operation does not split or lacerate the rail. The screw is also convenient for use at guard rails, frogs, and switches, and where the rails are so near together as to preclude the use of drawbars in drawing spikes. The merits of this device will be readily apparent to experienced railroad men.

This invention has been patented by Mr. William S. Huntington, of 143 Lexington Avenue, New York city.

AT a recent meeting of the Academy of Sciences, of Paris, M. Duclaux detailed the results of some experiments which he had made to determine the effect of sunlight upon the vitality of microbes. He found that a few hours of exposure to the direct rays of the sun were sufficient to weaken, and finally to destroy, the pathogenic micrococci used in the experiments. He argued, therefore, that the sun was the best disinfectant which we possess, the most universal, the most economical, and the most active.

BICYCLE SADDLE.

Mounted upon the bicycle spring is the saddle carriage, which is provided with rollers, arranged one above and the other below the spring at each end of the carriage. A small chain reaches from the carriage to a drum contained within a case secured to the backbone in front of the point where the spring is secured. The drum is loosely mounted on a shaft extending centrally through the case. Fixed to the drum are a ratchet wheel and an arbor, about which is coiled a spring, so arranged as to wind the chain upon the drum, and thereby draw the saddle forward. Suitable mechanism holds the drum in any desired position. This consists of a curved arm passing down behind the ratchet and then forward, so that a catch tooth it carries may be brought into engagement with the ratchet. The shank of this arm passes up through the center of a standard formed on top of the case, and terminates in a knob. The top of the standard and under side of a locking block through which the shank passes are so formed that by properly turning the block, the shank and its catch tooth may be raised to lock the ratchet or lowered to permit the drum to turn. The locking device prevents all possible chance of the accidental tripping of the parts.



STARBUCK'S BICYCLE SADDLE.

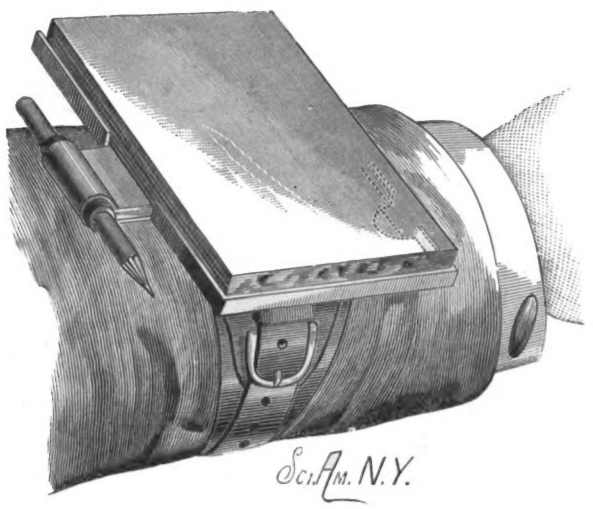
When the rider desires to adjust the saddle toward the drum, he turns the locking block and depresses the knob, thereby releasing the catch tooth from the ratchet, when the spring rotates the drum and winds up the chain. When the saddle has reached the proper position, the knob is released and the locking block turned to hold the parts in place. A spring acts to hold the catch tooth against the ratchet. Since the saddle can be moved to any required position upon the spring, the bicycle may be more easily mounted; and when going down steep grades, the saddle may be moved back, thereby preventing the liability of taking a "header." The backbone may be made longer, thus throwing the forks farther forward, and allowing the rider to get higher up on the wheel when ascending steep grades.

This invention has been patented by Mr. Calvin T. Starbuck, of Wilmington, Ohio.

OIL was struck at Zaleki, O., at a depth of 2,100 feet.

A WRIST-HELD MEMORANDUM PAD.

A means of avoiding the annoyance and inconvenience caused by misplacing memorandum pads and pencils, when one is occupied with work of various details, is shown in the accompanying illustration. Light metal plates are so made as to hold a pad by its pasteboard bottom, and to these are attached a strap to pass around the arm at the wrist, and buckle. Integral with these plates is a looped strip with a rubber



BOYLE'S HOLDER FOR TABLETS AND PENCILS.

tube for holding a pencil. The device is such that pads can be conveniently renewed therein as desired, and, with it buckled on the left wrist, one can readily write on the pads as occasion may call for, with the least possible interruption to other work.

This invention has been patented by Mr. Peter Boyle, of No. 350 West Congress St., Chicago, Ill.

Sand Dunes.

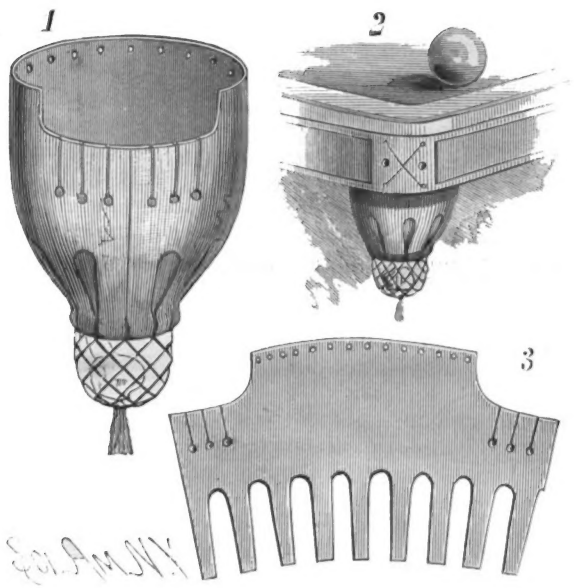
Nature gives the following interesting account of a successful scheme of overcoming the movement of sand dunes: M. Cambrelent, Inspector of Public Works, has made a report to the Agricultural Society of France on the subject of the sand dunes of Gascony. These sand hills cover a surface of more than 85,000 hectares; they are more than 80 meters high, and 5 to 6 kilometers wide. Before a method of arresting these was discovered, they were being constantly pushed inland by the winds, invading and covering fields, villages, and even burying churches up to their towers. In 1780 Bremontier sought to render them immovable by planting them, after many experiments designed to develop a primary vegetation. His work has been continued with perseverance, and it is only recently that it has been completed, and these 85,000 hectares, which menaced all the country adjoining, have become covered with a rich forest vegetation which has fixed the dunes in one place. A great public danger has been converted into a large forest. But this work, which renders permanent dunes already existing, has not prevented the sea from throwing up on the coast new sand day by day, which forms dunes, which in their turn invade the permanent dunes. After having fixed the old sand hills, the problem was to prevent the formation of new ones. To solve this, it was decided to construct a dune above high water, in which all the conditions of the movable dunes would be reversed. The form given to the latter by the wind is such that on the side of the sea they present a gentle slope, which the sand can mount easily as on an inclined plane, in order to fall down a steep decline. It is by the gentle slopes forming a series of inclined planes that the sand moves forward. The formation of the new dune was encouraged, but it was directed in such a manner that it had a steep slope on the side of the sea. To secure this, a wooden palisade was erected about 120 meters away from the sea, all along the shore. The sand first struck against this in its progress and fell at its foot, a portion of it escaping through the interstices left between the planks. The latter was carried some distance by the force of the wind, and fell, forming slight slopes, while the sand which fell at the foot of the palisade on the side near the sea formed a steep incline. Soon this reached the top of the palisade, and then the planks were drawn up by means of a special implement to the needed height, and the formation continued as before, the slope on the side of the sea growing steeper, while the other got more and more gentle. Ultimately the dune reached such a height (generally ten to twelve meters) that the sand can no longer get over it, and it is definitely arrested between the barrier and the sea. It falls back on the shore, unable to advance, until contrary winds come and blow it out to sea again. To fix the sand on the other side of the barrier, the Arundo arenaria is planted. The roots penetrate to a depth of four or five meters, and the plant always keeps its head above the increasing sand. The results obtained by this new dune (says M. Chambrelent) have been complete. The most violent storms have not been able to carry the sand over it; the latter has fallen back on the shore innocuous, and the advance of the inexhaustible sand coming from the sea has been absolutely arrested.

SAIL SKATING.

When the ports of the Baltic are closed by ice during winter, the pilots and sailors of Arnager Isle, at Copenhagen, delight to occupy their leisure hours with the exercise of skating by sail. This sport requires much skill and quite a long apprenticeship; but, after a person has become dexterous at it, it offers a very peculiar charm, and, when a swift wind causes him to glide over the surface of the ice, he feels himself lifted, as it were, and experiences a sensation analogous to that of flight. We give in Fig. 1 a diagram of the apparatus, such as we have seen it employed by the Danish skaters, and such as we have employed it ourself. The sail, which is formed of a light but strong fabric,* is stretched over a bamboo frame whose dimensions are given in the cut. The center crosspiece, which must be placed at the level of the shoulders, is fastened to the skater's body by bands that cross the breast and afterward pass around the waist, so that they may be tied together in front. Large crosspieces of wood, attached to the lower corners of the system, are held in the skater's hands, so that he may trim the sail in one direction or another. When the skater wishes to be carried along by the wind, he must stand very erect, without stiffening his body too much, and bend backward in proportion as the wind blows fresher. Confidence is acquired by practice. Fig. 2 gives the position of the skater going with the wind and under full sail. When the wind is too violent, the topsail may be readily lowered (Fig. 3), so as to thus moderate the impulsion derived from the moving air. By inclining the sail in one direction or the other, the skater may tack to the larboard or starboard (Figs. 4 and 5). Finally, when it is desired to move against the wind, by skating in the usual way, the body is bent forward in such a way that the sail lies horizontally, and no longer offers a purchase to the aerial current (Fig. 6). The skater can thus return to his starting point, and from thence be driven forward again by the wind.

This exercise is a very agreeable one, and not very dangerous; and the falls that a person gets in beginning are not to be dreaded, because they almost always occur backward. The degree of speed that can be attained by a practiced skater is considerable, and yet is less than that of certain ice boats when these are sailing in high winds. When the skater gets through using his apparatus, he detaches it from his shoulders, winds the sails around the bamboo sticks, which may be separated from them, and thus has an object that is no more trouble to carry than an umbrella would be. When the winters are severe, it is not unusual to meet upon the ice numerous groups of skaters by sail who are endeavoring to excel each other in speed. Young people are often seen, too, setting out on an expedition over the frozen sea between Denmark and Sweden, and traversing the entire Sound. These latter use the sail when the wind is favorable, but fold up the apparatus when the contrary is the case, and make use of their skates in the ordinary way.

Danish hunters, likewise, often have recourse to skating by sail in order to rapidly reach points where wild ducks and geese have been observed. On one of these hunting excursions we chanced to pursue an unfortunate stray fox over the ice, and competed with him in speed when he was running in the direction of the wind. We came very near catching him in the race.—*La Nature.*



SEELY'S BILLIARD TABLE POCKET.

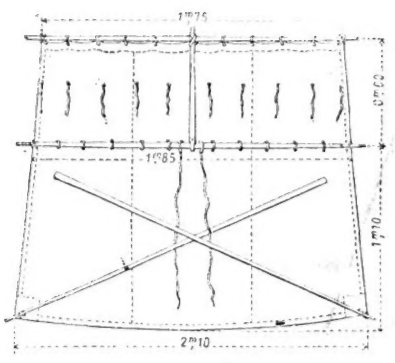


FIG. 1.—DIAGRAM OF THE SAIL AND ITS FRAME.

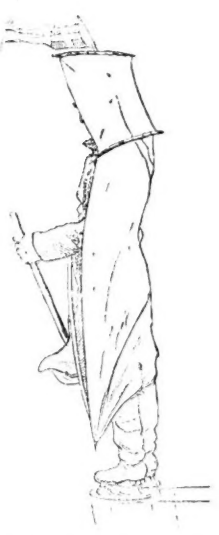


FIG. 2.—DOWN THE WIND. FULL SAIL.

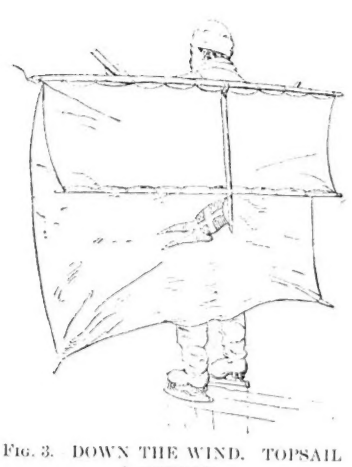


FIG. 3. DOWN THE WIND. TOPSAIL LOWERED.

FIG. 4.—STARBOARD TACK.

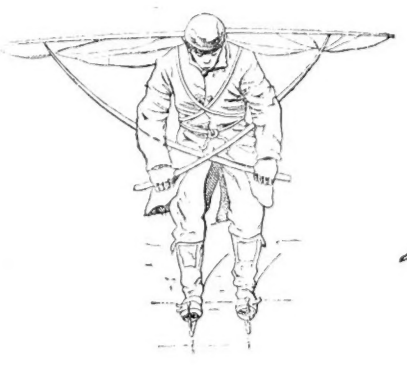


FIG. 6.—IN THE WIND'S EYE.

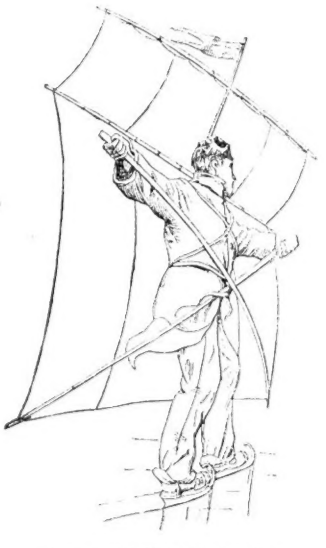


FIG. 5.—LARBOARD TACK.

IMPROVED POCKET FOR BILLIARD AND POOL TABLES.

A billiard and pool table pocket in which the chalk cannot be broken by the striking of the balls is shown in the accompanying illustrations, where Figs. 1 and 2 represent the pocket unattached and in position on the table, and Fig. 3 shows the blank for making the body of the pocket. These pockets are preferably made of leather colored green, to correspond with the cloth on the table. It will be seen that the blank is so formed that its lower end strips may be contracted and folded over a ring to give the proper shape to the pocket, the ring leaving an opening to allow the chalk to pass through, but affording a seat to receive the ball. Attached to this ring is also an additional or lower pocket, of netting, to receive and hold the chalk in such separate compartment.

This invention has been patented, and the pockets are manufactured, by Mr. David W. Seely, of No. 118 Lake Street, Elmira, N. Y.

OXYGENATED water, or peroxide of hydrogen, for bleaching, is being manufactured in England in a concentrated condition, and sold at the rate of 5¾ d. per pound, in quantities not less than one carboy.

* Chinese pongee silk is admirably adapted for the purpose.

WHITE BRONZE.

We illustrate on our front page an industry that has been gradually developing for the past two years—one that has been watched with much interest by those who have a desire to see progress in American art productions, but more particularly by scientists, who have always recognized the merit of the material used, and that it only required time and proper manipulation to demonstrate its desirable qualities and, to them, unquestioned superiority.

The necessity for a more enduring material for monuments than stone has long been felt. It is well known that stone is unable to withstand climatic effects, as described in scientific articles by Prof. A. A. Julien, of Columbia College, New York, Prof. R. Ogden Doremus, and other eminent scientists, and demonstrated by the crumbling condition of the obelisks of New York and Paris, and of all the oldest stone monuments and buildings in this country and Europe.

The enduring nature of the metal used—refined zinc—and its peculiar adaptation to the purpose have long since brought it into use in Europe, where the art has made good progress, taking the place, to some extent, of copper or antique bronze for monuments and statuary. The Prussian Government has recently erected some large statuary of this material, notably the Postal Union statue at Hanover, illustrated in SCIENTIFIC AMERICAN SUPPLEMENT. Ure's "Dictionary of Arts," enlarged edition, also refers to the extensive use of the metal in Continental Europe, large foundries being located in Berlin, Cologne, Hanover, and other cities.

From the earliest use of the material there seems to have been but one opinion regarding its enduring qualities. Encyclopedias, standard works on metallurgy and chemistry, and scientists are unanimous in commending its lasting nature; and the facility with which it is moulded into the most artistic designs will ultimately make white bronze more popular for art work than the copper or antique bronze which has heretofore been used so extensively.

The name white bronze was adopted for this perfected and finished material as an appropriate one to distinguish it from the dark or antique bronze, also from the cheap statues made of sheet metal. It is claimed by the manufacturers that white bronze, as now made, is so well adapted to monumental purposes that it will ultimately supersede all other materials. Experience has enabled the producers to overcome the many obstacles that at first presented themselves, principal among which was the difficulty of obtaining metal sufficiently purified to retain its color; this has been entirely overcome.

The monuments and statuary are cast as thick, or thicker than, copper bronze. The designs are first modeled in clay and reproduced in plaster of Paris, from which a wax cast is taken, this cast being necessary in order to procure a perfect metal pattern, from which the monument is moulded and cast in the ordinary way.

Our illustrations show two important features in the production of this work, one being the fusing and joining together of the different parts by pouring molten metal of the same material as the castings, at a high degree of heat, along the joints; this makes them practically one solid piece, and the corners the strongest part of the work.

The other illustration is that of the application of the sand blast, which gives the surface of the work a pleasing appearance which it always retains, being in this respect superior to copper bronze, which soon after exposure becomes black and unattractive.

The work of finishing and preparing for the sand blast requires a high degree of artistic and mechanical skill; with the exception of the sand blast, all the finishing is hand work, and necessarily expensive.

Metal possesses many advantages over stone for monumental purposes aside from its greater durability; the positive assurance of the raised lettering or inscriptions remaining legible for ages is itself worthy of appreciation, as the value of any monument lies in its ability to legibly retain its record. The monuments are made with removable tablets, for the purpose of adding inscriptions in the future. White bronze is also free from the discoloring influences of trees or growths of moss or mildew, and is not affected in the least by the elements of the atmosphere, so destructive to stone.

It is stated that the granite obelisk in Paris, which has only been erected there forty years, has so far decayed that the French Government have taken plaster casts of the surface to preserve the inscriptions for historic use; and our own obelisk, which has only been in Central Park for five years, is already disintegrating from the effects of the climate, and scientific men have been called upon to devise means for its preservation, while the old metal and bronze monuments in Europe, that have stood for centuries in the most rigorous climates, are still as perfect as when new.

Monuments and statuary for cemetery purposes are produced of all sizes, styles, and designs, competent artists being constantly engaged in modeling original monumental designs, as well as statues, portrait busts, medallions, etc., to be used in connection with granite and bronze monumental work. Our illustration shows the artist's studio at the Bridgeport foundry. Among the recent productions were life-sized busts of Martin Luther, for Allentown, Pa.; Sergt. Major Reynolds, of this city, recently unveiled in Greenwood Cemetery; and statue of Pilot Woolsey, erected in Evergreen Cemetery. A large number of white bronze public monuments have been erected, prominent among them being the one shown on our front page, recently unveiled at Grand Rapids, Mich., which was cast at the Detroit foundry; as a monumental fountain it undoubtedly surpasses all previous productions of this nature that have come to our notice.

We illustrate the different art foundries engaged in the production of white bronze, as well as the exhibit made at the World's Fair, New Orleans, at which the goods were awarded the gold medal; a gold medal was also awarded white bronze at the Southern Exposition, Louisville, Kentucky, last fall, also a medal awarded them at the American Institute Fair, 1884, where a fine display of statuary can now be seen. The work is produced exclusively by the Monumental Bronze Company, Bridgeport, Conn., the Detroit Bronze Company, Detroit, Mich., the Western White Bronze Company, Des Moines, Ia., the American White Bronze Co., Chicago, Ill., and the St. Thomas White Bronze Monument Company, St. Thomas, Ont. It is expected that other foundries will soon be established in the West and Southwest.

The time honored custom of using marble and granite for monumental purposes, and the faith that seems to prevail in the enduring qualities of the products of the "everlasting hills," naturally cause a strong opposition to the introduction of metal in this connection; but careful observers have long since noted the shortcomings of marble and granite when exposed for any length of time to atmospheric influences, and they are not content to intrust their family records to such perishable material.

The production of white bronze monuments and statuary has until recently been prosecuted in a quiet, unostentatious way; but with the addition of needed improvements and increased capital, so great has been the development during the past few years that four foundries are now required to supply the rapidly increasing demand. We are living in the age of telegraphs, telephones, electricity for lights and motive power, and many other useful improvements regularly chronicled in these pages, all of which have a value in their peculiar uses, and so with the subject of our sketch on front page.

Iron Ores.

A writer in *Science* gives the following composition as the work of a boy in a New England grammar school:

IRON ORES.

This morning the teacher passed each boy three specimens. One of the boys brought his specimens to the desk, and the teacher tried them with a magnet. One of them was reddish, the other was yellowish, and the other was black. The yellowish one and the reddish one we found was not magnetic, but the black one was magnetic. These specimens were all iron ore, from which iron is obtained. From the black ore, we found that the best iron was obtained from it.

We were then told to rub each specimen on a piece of paper. The red specimen made a red mark, and the yellow specimen made a yellow mark. From the other specimen, which was black, the most of us could not make it mark on account of its hardness; but our teacher told us if there were some powder on it, we could make it mark a black streak.

Then the teacher took some small pieces of the yellow ore and put them in a test tube, and held the tube over the flame of an alcohol lamp, and each line filed around to see what it formed in the tube, which was water. There was no water in the tube when the ore was put in, therefore it must have come from the ore. This ore is called limonite or bog iron ore, because it has so much water in it, and is found in wet, marshy places. The name of limonite came from a word meaning meadow.

The teacher then took them out of the test tube, and tried them with a magnet, and found they were not magnetic. It was proved that they were not pure iron, because they would not stick to the magnet.

We found that these pieces of iron ore contained iron and oxygen, therefore they were iron oxides. When these pieces were rubbed on paper, they made a streak like the red ore. The name of this red ore is hematite, which means blood red. Hematite is composed of iron, oxygen, and no water; and once it was supposed to be limonite, and the water driven out of it by the heat of the earth.

Teacher then took the pieces of limonite which was heated in the test tube, and put them in a piece of charcoal, which is a form of carbon, and blew the flame of an alcohol lamp on the charcoal by a blow pipe. After she got most of the oxygen out of the pieces, she then took them on a piece of paper, and tested them with a magnet, and found the smallest pieces were magnetic, because they were heated the most. The black ore is magnetite, which contains the best iron.

Correspondence.

Diamond Mining in South Africa.

To the Editor of the Scientific American:

Ever since diamonds were discovered in South Africa the ingenuity of South Africans has been taxed to invent some method which will prevent the stealing of diamonds by the employes in the diamond mines, but thus far with but little success. It is estimated that $10,000,000 worth of precious stones are annually stolen by the natives and others engaged in diamond mining. Diamonds are found in what is called, from its color, "blue ground," the area of which is well defined. This "blue ground" is loosened with pick, shovel, and dynamite, shoveled into trucks, and hauled to the surface. The ground is then exposed for some days to the weather, which disintegrates and pulverizes it. It is then run through washing and sorting machines. Now, take a man engaged with pick and shovel, wheeling the debris out, emptying it, and returning, and you have a very fair illustration of the work done by the thieving portion of the diamond diggers.

Now, a problem I wish to place before our American inventors for solution is this: What contrivance or appliance would permit a man to carry on his work of excavating, and at the same time prevent his picking up and secreting a pebble?

JAS. W. SILER, U. S. Consul.

Cape Town, Sept. 16, 1885.

Preservation of the Central Park Obelisk.

To the Editor of the Scientific American:

Referring to the article in last week's paper on the decay of Cleopatra's Needle in Central Park, I beg leave to give my experience in such a case. In 1865 I built a stone house for Wm. Duncan, Esq., of Innerleithen, Scotland, under the superintendence of the late David Bryce, of Edinburgh (an eminent architect). He, having doubts of the durability of the stone, gave me a receipt to apply to the exposed surface, the principal ingredient of which is boiled linseed oil. I have never known it to fail.

In the case of the Cleopatra Needle, it would require to be protected from the weather while being treated, the moisture in the stone dried out, and the decayed portions carefully removed; the cracks would have to be filled up with the same preparation mixed with ground stone.

I saw the Cleopatra's Needle last year, and the necessity for such treatment was very apparent to me then. Its decay will be very rapid unless something is done.

We took down the Tennessee Bank building about two years ago. It was built of hard blue limestone, the same as the capitol in Nashville is built of (which is scaling off very rapidly). I found the pillars of the bank in front perfect, while the rear of the building, was much decayed. On examination, I found the pillars had been treated to a dressing of this same preparation.

I send you a small sample of the stopping used in mending one of the pillars, which is made of this preparation mixed with ground limestone, and which has stood the weather for forty years without any alteration.

I have found, where stone has been mended by shellac and a hot iron, that the heat always showed signs of having injured the stone, especially in granite. I am afraid it would not do to apply heat by means of charcoal furnaces; it might do more harm than good.

JOHN OMAN.

Nashville, Tenn., Oct. 30, 1885.

P. S.—In taking off the inclosed sample from one of the old columns, you will see that part of the stone came off, showing how the preparation adhered to it. It also shows how it penetrated into the stone, thereby preserving it from the weather. The sample we send by mail in a separate package. J. O.

Amended Regulation Concerning the Ductility of Steel Boiler Plate.

Supervising and Local Inspectors of Steam Vessels and Others:

It having been ascertained to the satisfaction of the Treasury Department that the regulation requiring a reduction of area of 53 per cent on all steel boiler plates of 65,000 pounds tensile strength and upward is an actual prohibition of the manufacture of such plates, the Secretary has modified the regulation so as to require a reduction of area as follows:

Tensile strength.	Reduction of area.
70,000 pounds	43 per cent.
65,000 pounds	50 per cent.
60,000 pounds and under	55 per cent.

A CORRESPONDENT in Turkey describes a discovery of a cave by two workmen in a colliery near Tyre in Phœnicia. On entering the cave, there were found four sarcophagi, with relief figures of men, trees, flowers, of a very fine workmanship. By breaking a hole in the wall of the cave, a square yard was reached, with two similar sarcophagi, and with a number of earthen and glass vessels. It is supposed that the cave was a burial vault. The sarcophagi will be opened in the presence of the Governor of Damascus.

American Trees in Autumn.

Now that deciduous trees and shrubs are once more beginning to attract the attention which they so well deserve, and which was diverted from them when conifers became such favorites, instead of the monotonous somber green of the pines and their allies we may expect to see more frequently the delicate tints of early spring furnished by the swelling leaf buds or opening blossoms, the manifold shades of green during the summer months, and the brilliant coloration assumed in autumn by many of the fine deciduous trees from North America and Eastern and Northeastern Asia, which were much more generally known at the commencement of the present century than they are now.

If planters would but note the wondrous autumnal changes in the foliage of many deciduous trees, and plant accordingly, they could easily create such effects as would as much surpass the ordinary haphazard style as a picture by a "Turner" would be superior to another painted by a schoolgirl. With care, too, the summer tints might be made to thoroughly harmonize, so that at all times the individual beauty of a tree might be enhanced by judicious contrast. Trees with totally different habits might also be chosen, so that, even when leafless, the tracery of the branches would be a source of artistic enjoyment. My remarks are, however, confined to autumnal tints and to trees and shrubs which are most noticeable at the present moment. Many of these are somewhat uncommon, all are strikingly handsome, and even the common one deserves to be more generally known and appreciated.

For truly gorgeous coloration in autumn, some of the American oaks bear off the palm. Perhaps the most beautiful is the quercitron oak, of the eastern United States (Quercus tinctoria), the fine, deeply-lobed foliage of which, in autumn, exhibits a lovely combination of dark, glossy green, crimson, and reddish brown, the green occupying generally the central portion of the leaf. Quercus rubra (the red oak) and its varieties are especially noteworthy; in these the redder tints of the decaying foliage are more unalloyed with other shades, so that in the sunlight the leaves brighten up and glow as if they were on fire. Q. alba (the white oak) is a noble tree with large leaves, brownish red being the prevailing shade in autumn. The chestnut oak (Q. prinus) and its varieties, with their large, chestnut-like leaves, are hardly less beautiful than the quercitron and red oaks, and assume autumnal colors in which bronze and reddish purple predominate.

Totally different in color and habit of growth are the hickories, two of the most showy in autumn being the pignut hickory (Carya porcina) and the small fruited hickory (C. microcarpa), from the eastern United States; both have walnut-like foliage, and the large leaves of the first die off a uniform rich golden yellow. The yellow wood (Cladrastis tinctoria), from Kentucky and Tennessee, is one of the handsomest of the flowering trees of the locust kind; in early autumn it is clothed with large pinnate leaves of a fine orange yellow. The bird cherry (Prunus padus), particularly when planted in open ground, has leaves tinged with rosy red when dying, and one of the prettiest effects I have ever seen was a fine group of bird cherries with a background—a few yards away—of dark, glossy, evergreen shrubs.

The June Berry (Amelanchier canadensis), although not possessing the delicate tints of the last named, wonderfully enlivens the autumn shrubbery with its red-brown leafage. The red mulberry (Morus rubra), from the eastern United States, is very conspicuous in October on account of its sulphur-colored, prettily lobed leaves; it is a small tree, and, with a background of dark green such as that afforded by the evergreen oak (Quercus ilex), is most striking. The blue beech (Carpinus americana) is a small tree from 10 feet to 20 feet high; its decaying leaves exhibit a charming combination of green, golden yellow, light red, and crimson. The South European Acer opulus furnishes us with a mixture of purplish, orange scarlet, and brown tints. The cherry birch (Betula lenta) of the northern and northeastern United States makes a fine object when covered with clear, golden yellow foliage, which is especially attractive in sunlight. The black or sour gum, or pepperidge—for under all three names is Nyssa multiflora known in its native haunts, the eastern United States—has fine, bold, glossy leaves, assuming in early autumn a brilliant orange-scarlet color; an accidental combination of this with a specimen of Ptelea trifoliata, with its lemon-yellow, pinnate foliage, produces a very happy effect.

The Silver Leaf Maple (Acer dasycarpum), which, on account of its rapid growth and beautiful foliage, is much planted as a shade tree in the United States, is one of the finest of deciduous trees. In early spring it is covered with myriads of reddish flowers; then its handsome leaves, green above, silvery white below, turn in autumn to a golden yellow. The red maple (Acer rubrum), more compact in form and less rapid in growth than the preceding, is also very ornamental in autumn, and in spring its deep red blossoms render it conspicuous and beautiful. The sugar maple (Acer saccharinum) is one of the noblest of American trees, and is much valued both for its wood and for the beauty of its form and foliage; in summer its leaves are a light green, but in autumn are a clear yellow. The tulip tree (Liriodendron tulipifera) is one of the largest and most beautiful of North American trees; as an ornamental tree it is at any time hardly surpassed, but in October, when its foliage is suffused with a rich golden glow, it is especially striking, a fine specimen making quite a feature in the landscape. The brilliant autumnal colors of the sweet gum (Liquidamber styraciflua) are too beautiful to be passed over without notice; rich orange-scarlet, crimson, and yellow give place in some individuals to a dull purple, the long-stalked, star-like leaves, when well covered, being especially handsome. This tree retains its rich leaf coloring for some weeks.—*Q., The Garden.*

APPARATUS FOR THE RECOVERY OF TAR AND AMMONIA FROM BLAST FURNACES.

One of the most important questions of the present day in connection with blast-furnace practice is that of the recovery of tar and ammonia from the furnace. This was evidenced at the recent meeting of the Iron and Steel Institute, at Glasgow, by the interest shown in the paper on that subject by William Jones. In that paper reference was made to the apparatus for dealing with this subject designed and patented by Mr. John Dempster, of the firm of R. & J. Dempster, of Newton Heath, Manchester, and which is now in operation at Messrs. R. Heath & Son's works, near Stoke-on-Trent, being the only works which has yet attempted the recovery of tar and ammonia from blast-furnace gases in England. This apparatus is illustrated in our present issue, where Fig. 1 represents a perspective view of the works, our illustration having been engraved from a photograph. Fig. 2 shows a plan of the works, the various details of the plant being indicated thereon.

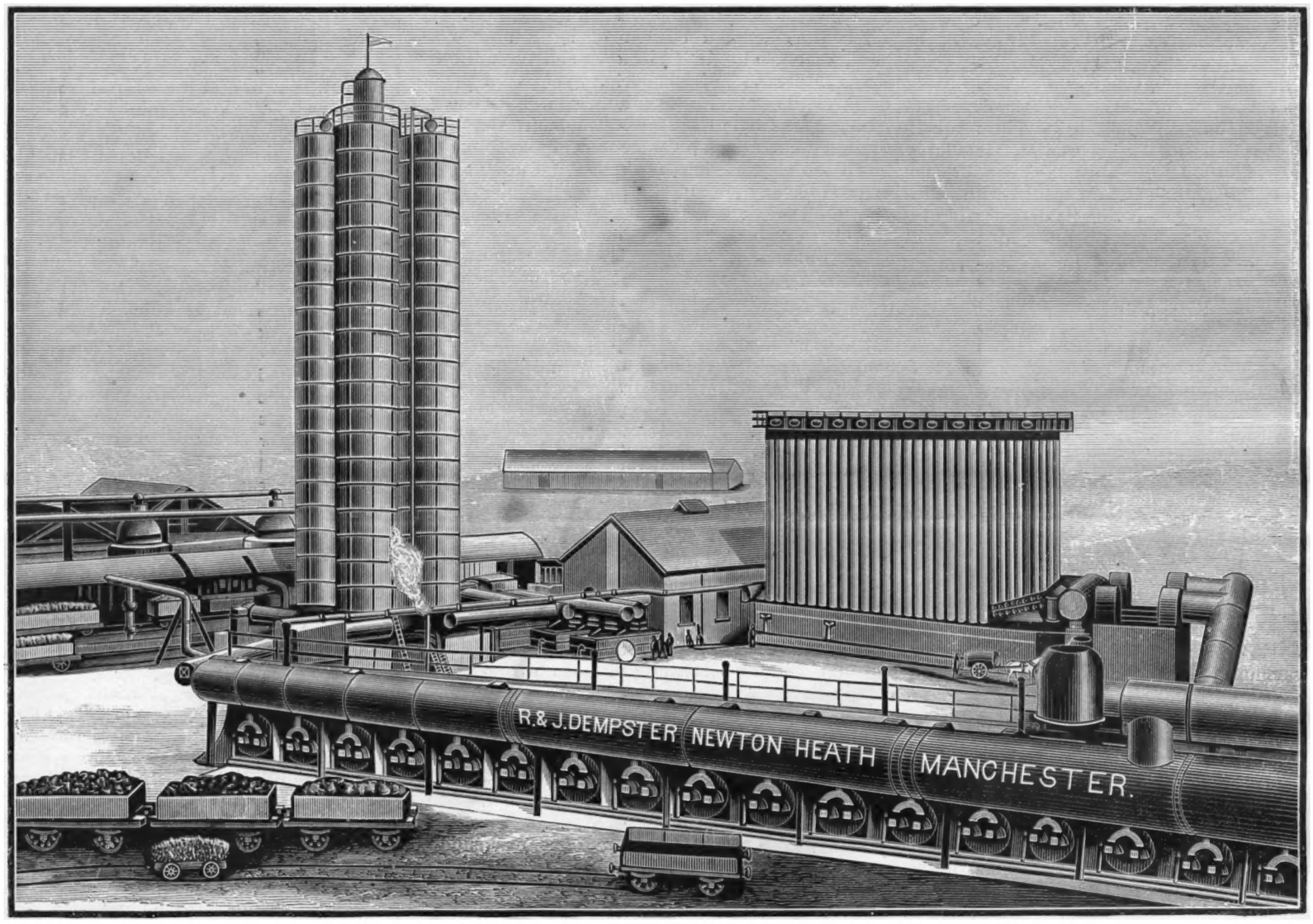


Fig. 1.—APPARATUS FOR THE RECOVERY OF TAR AND AMMONIA FROM BLAST FURNACES.

Mr. Dempster, being a gas engineer and constructor of gasworks, has adopted apparatus generally used in ordinary gasworks, but adapted to the special requirements of blast-furnaces. The blast-furnaces of Messrs. Heath are situated close to the forges, mills, and collieries of the firm, and the gases from the furnaces raise steam for these. Therefore, Mr. Dempster had to keep in mind that these gases were valuable, and that he must use every economy in reference to them. The gases are conveyed first to the ammonia still, and the flues of this still are made three times the size of the other pipes, Mr. Dempster's object being to cause the gases to flow slowly round the still, and, by reducing the speed, to allow the dust to fall to the bottom of the flue, where, by an arrangement of scrapers, he collects this in a well at the end of the still. The well can be shut off from the flue by dampers, and the dust removed without having to stop working the still. The temperature of the gases being much higher than boiling point, the NH_3 from the liquor is driven off without any expense for fuel. The still is 40 feet long and 7 feet diameter, and holds about twenty-four hours' make of liquor, and the ammoniacal liquor is continually being pumped in, and, having baffle plates in the still, it flows on to the other end and out. As the still holds twenty-four hours' make of liquor, the liquor is twenty-four hours under the influence of the heat, and all the NH_3 is driven off. By an arrangement of valves the gases can be shut off from the flues of the still if required. The gases then flow on to what Mr. Dempster terms dust boxes, owing to their purpose being to arrest the remaining dust that

may have passed the flues of the ammonia still, but they are really washers. They are two wrought iron vessels, each vessel being divided into four compartments, and in each compartment a plate with serrated edge depends from the top and dips into the liquid; the bottom of the vessels slope toward the front. The gases are thus caused to pass four times under water, and it is found that most of the tar is given off at these vessels, and that they answer the purpose of arresting the dust. These vessels are arranged so that either can be shut off for cleaning (if this should ever be required) while the gas is passed through the other.

The gases at the outlet of the dust boxes are found to be very much reduced in temperature, and are then brought down to the temperature of the atmosphere by two pipe condensers. These condensers consist of 100 wrought-iron pipes, 40 feet long and 20 inches in diameter, placed in five rows of twenty each upon a cast-iron box, which contains the necessary division plates for shutting off each row from the other, while allowing the condensed matters to flow underneath. This cast-iron box has also a sloped bottom similar to the dust boxes. Valves are fixed at the end of each row of pipes, so that any row can be shut off; and by taking off the blank flanges from the top, each pipe can be cleaned if this should ever be required. Arrangements are made at the top of these pipes so that cold water is directed on to them, and thus the condenser is rendered very effective. The gases are then drawn through the exhausters, which consist of four of Root's blowers, driven by a pair of horizontal engines. The blowers have valves fixed at the inlet and outlet, so that they can be shut off for repairs if necessary. Following the exhausters come four washers, the gas dividing through the first two, and then again dividing through the other two. These are arranged in pairs, with valves, so that they can be shut off and cleaned if required without stopping the whole of the apparatus. The interiors of these washers are fitted with four plates with holes varying in size and getting smaller toward the outlet, the last plate of the last washers having holes $\frac{1}{16}$ inch diameter. The object of these is to take out the last traces of tar before the gas gets to the scrubbers, and this they do very effectually.

The gas then enters four round scrubbers 100 feet high and 12 feet diameter, which are filled with about 300 tons of wood boards, and on the top of each of the first three scrubbers is an apparatus for distributing the liquor over the boards. This apparatus is self-acting, each scrubber having a large steam pump which pumps the ammoniacal liquor through all four scrubbers alternately. The last one has clean water pumped through it, though in much smaller quantity than through the others. This scrubber takes out the last trace of ammonia, and the gas then passes on to the boilers. The scrubbers, being set in a square, stand very firm; in the center between them is a spiral staircase. The scrubbers are made in rings of plates 5 feet deep, and in each ring of plates is a flap valve, held to its face by a heavy weight, so as to give immediate release in case of an explosion. These valves also act as manholes to the scrubbers, being 18 inches in diameter. Mr. Dempster has also placed these valves in numerous places about the apparatus, so that each section of pipe or apparatus shall have safety explosion valves. Between the scrubber and the boilers is introduced a box, which is partly filled with water, and has a plate dipping into it, so that the gas can be forced through the water. This is only intended to be used when the plant may have been standing and is being again put into operation, as, if the gas should be sent on to the boilers too soon, any explosion would only strike back as far as this box.

This apparatus has been at work about two months, and from its first being put into operation has continued to give every satisfaction. The whole arrangement was so well considered beforehand that no alterations have yet suggested themselves as being required. The firm are now erecting plant to deal with the tar, it being the intention when the present plant was designed to sell the tar to the neighboring tar distillers. The price of tar, however, has fallen so low that it is considered most profitable to distill the tar on the premises, and thus save any cost of carriage. Mr. Dempster claims as the advantages of this apparatus, first, that he does not consume any of the gases in working the plant, nor does he injure the quality of the gases in any way, no vapor being carried along with the gas, or any acid vapors; and secondly, that he gets his ammonia liquor up to a good strength of NH_3, and that the labor is very small, two men for day and two men for night being all that are required to work it. The cost of this apparatus is, we understand, about £6,000 per furnace. The sulphate of ammonia, paraffin wax, heavy paraffin, and light oils recovered by this process from the blast furnace gases at Messrs. Heath's works are of excellent quality, as evidenced by the samples inspected by us. The products from the tar given off from the furnace gases are stated to be more valuable than the products obtained at the present time from the ordinary gasworks tar.—*Iron.*

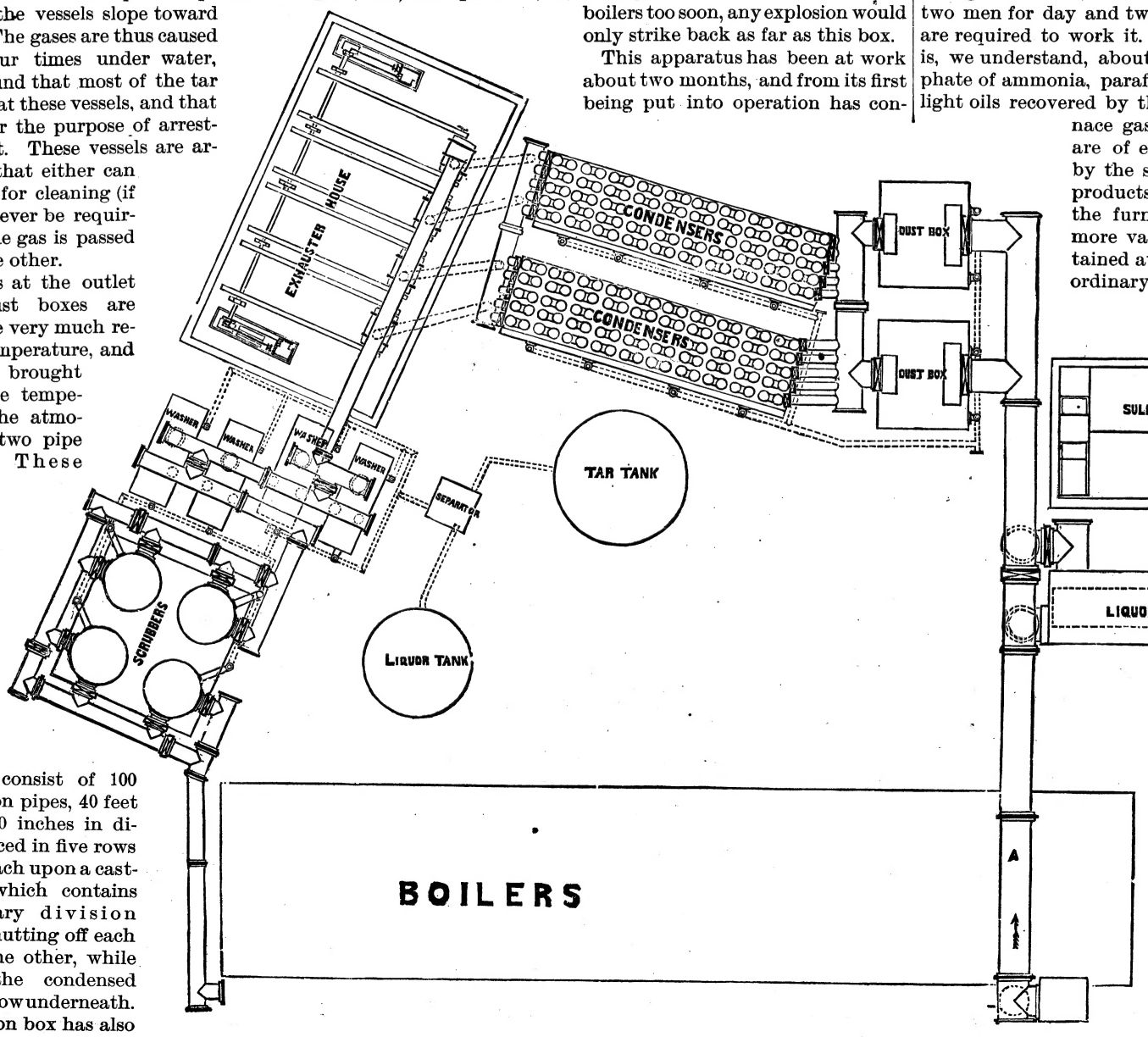
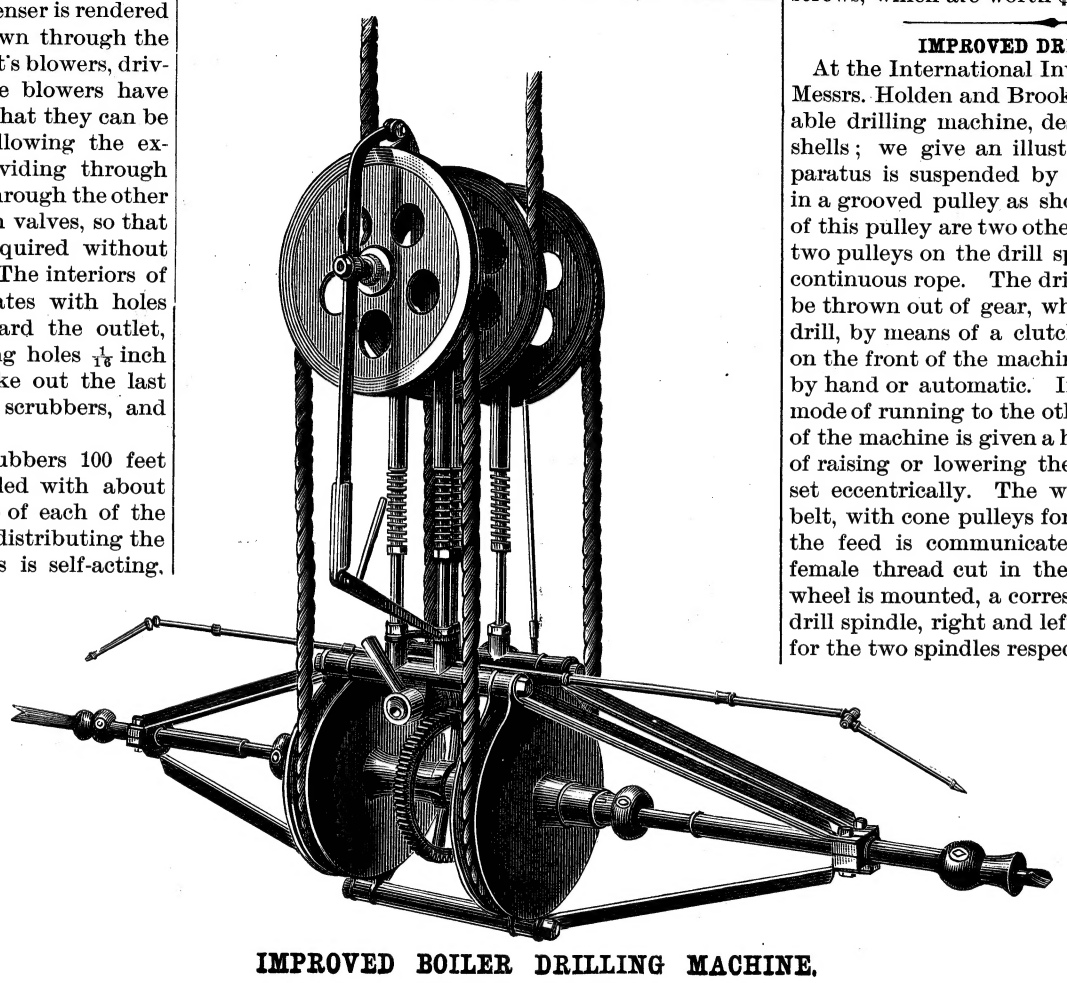


Fig. 2.—PLAN VIEW.—APPARATUS FOR RECOVERY OF TAR AND AMMONIA.

A NEWSPAPER correspondent describes the American watch manufactory at Waltham, Mass., and in speaking of the astonishing minuteness of some very essential parts of the watch says: "A small heap of grain was shown to us looking like iron filings or grains of pepper from a pepper caster—apparently the mere dust of the machine which turned them out; and these, when examined with a microscope, were seen to be perfect screws, each to be driven to its place with a screw driver. It is one of the statistics at Waltham worth remembering that a single pound of steel, costing but 50 cents, is thus manufactured into 100,000 screws, which are worth $11."

IMPROVED DRILLING MACHINE.

At the International Inventions Exhibition, London, Messrs. Holden and Brooke, of Salford, exhibit a portable drilling machine, designed to work inside boiler shells; we give an illustration of this tool. The apparatus is suspended by its driving rope, which runs in a grooved pulley as shown. Mounted on the shaft of this pulley are two other pulleys, one of which drives two pulleys on the drill spindle below, by means of a continuous rope. The driving pulley of this series may be thrown out of gear, when it is required to stop the drill, by means of a clutch operated by a lever shown on the front of the machine. The feed may be either by hand or automatic. In order to change from one mode of running to the other, the small handle in front of the machine is given a half turn. This has the effect of raising or lowering the worm, as the worm shaft is set eccentrically. The worm gearing is driven by a belt, with cone pulleys for different rates of feed, and the feed is communicated to the drill spindle by a female thread cut in the sleeve on which the worm wheel is mounted, a corresponding thread being on the drill spindle, right and left handed threads being used for the two spindles respectively. As the drills run in opposite directions, they can both be ground right-handed. A feed of 9 inches can be given to each drill; and for variations in the diameter of boiler shells beyond this compass and up to 8 ft. diameter, intermediate lengths of spindle have to be introduced. The spiral springs shown on the vertical distance rods are for the purpose of keeping the stretch on the driving rope, so that the pulleys will not slip with heavy work. As rigged for work, the driving rope from the countershaft runs over a guide pulley mounted in a sliding frame. This pulley is counterbalanced, and in this way the whole machine may be raised and lowered with facility by one man.—*Engineering.*



IMPROVED BOILER DRILLING MACHINE.

HOW TO PACK A MULE.—THE DIAMOND HITCH.

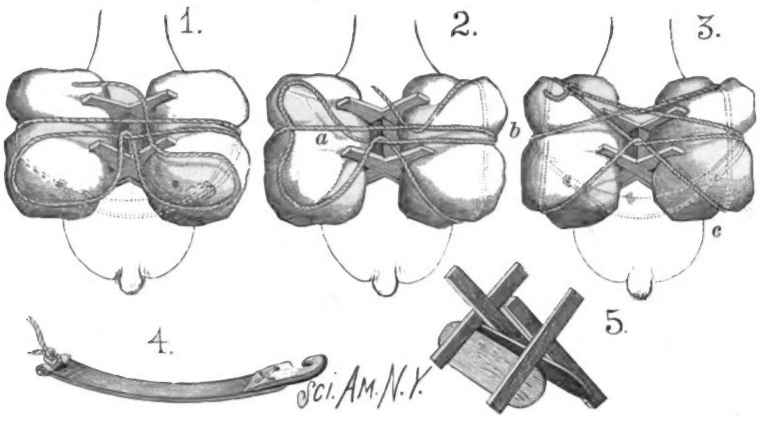
It fell to the writer's lot, some years ago, to travel through the Yellowstone region with a train of pack animals, horses and mules. This was in the early days, before the Northern Pacific Railroad had opened up that region to civilization. All the more bulky *impedimenta* of the party were carried by pack animals, any approach to a wagon being considered inadmissible. The pack saddles used by us were of the simplest description. In construction they resembled a small, light sawbuck, with side boards fastened under the crossed pieces, to come upon the animal's back. In saddling, a piece of blanket was first put on, then the saddle was girthed, or, in Western phrase, "cinched," on very tightly. In the southern regions, Mexican pack saddles are much in vogue. These are not so simple, resembling, to some extent, an ordinary riding saddle, but with immense square skirts.

The operation of packing involves the use of the peculiar knot, very famous in its way, termed the "diamond hitch." By its agency the packs are fastened rigidly in position on the back and sides of the animal carrying them. After the animal has been saddled, the packs, divided into two even portions, are slung up, half on each side, by two packers. To the parts of the saddle corresponding to pommel and cantle, short lines are fastened. The packers hold the packs up against each side of the pack animal, and passing the ropes around the articles from underneath, and up, over, and across the back, tie the ends together so as to hold all in position. Any small articles are piled on top, and all is ready for the diamond hitch.

To make this, a piece of 2 or 3 inch rope is used, about 30 feet long. One end is fastened to a short girth or cinch. To the other end of the cinch is secured a large flat hook, generally made of wood. In the army a long leather strap, about an inch wide, is used instead of the rope. Throughout the whole operation the packers work in pairs. One stands on the near or left side of the animal, whom we shall designate as A; the other stands on the off or right side, and will be called B. The packing rope and cinch are taken by A on the near side. He swings the hook end of the cinch across under the animal's belly to B, who catches it. Then A makes a bight in the part of the rope near the cinch, and throws it over across the top of the pack to B, who inserts it in the hook. Thus two leads of the rope run over the top of the pack transversely. A then turns a half hitch with large loop in the next succeeding part of the rope, and passes the free end to B. This end B passes over the second and under the first lead of the rope lying across the packs, and as near the center as may be. The state of things at this point is shown in Fig. 1.

The left hand part of the half hitch is passed under the cross rope by A, while the free end of the rope is passed as described by B. Fig. 2 shows this phase of the operation. In this way two loops are formed, one for each side. A's loop lies under the cross line, while B's loop comes outside of everything. All these operations are executed in a few seconds, no exact order being followed. The tightening process comes next. B begins to pull the rope backward and upward, grasping it at *b*, Fig. 2, putting his knee, or even foot, against the hook for a purchase, while A takes in the slack as fast as given him from B's successive pulls, grasping and pulling the rope at *a*, Fig. 2. When no more can be gained, and the poor brute is compressed as much as possible, A passes the loop on his side tightly around and partly underneath his half of the pack. Then B, grasping the rope at *c*, Fig. 3, pulls diagonally backward and outward. This begins to "spread the diamond." He next puts his loop in position, when A, taking hold of the free end of the rope, pulls it diagonally forward and outward, over the withers of the horse. This completes the spreading of the diamond, and it will be at once seen that this separation of the two leads of the rope tightens it with enormous power. After A has given the final pull, he ties the free end of the rope wherever convenient, thus completing all. The final result is shown in Fig. 3. The last two pulls consolidating the pack nearly double up the poor animal. The cinch, often cruelly narrow, is drawn up into his belly until the profile forms a double curve, his body being violently squeezed upward. After packing, the poor beast will sometimes go off, as it were, on tiptoes, trying to relieve himself by motion. To untie the hitch, the end of the line is untied and cast loose, and withdrawn from under the cross lead of the rope. Then the whole being slackened, the bight is withdrawn from the hook, and the rope comes off without a knot. If a knot is formed, it is a sign that a mistake has been made in the tying.

The tightness of the "lacing" to which the animals are subjected has an element of mercy in it, because, if the saddle shifts about, a sore back inevitably results. With the spread of railroads and wagon roads the tying of the diamond hitch may take its place among the lost arts. The writer has used it in roping large, irregular bundles, and its power in such cases is surprising. A simple loop tied on the end of the rope was made to serve instead of the cinch loop.



HOW TO PACK A MULE.—THE DIAMOND HITCH.

Natural Gas Pyrotechnics.

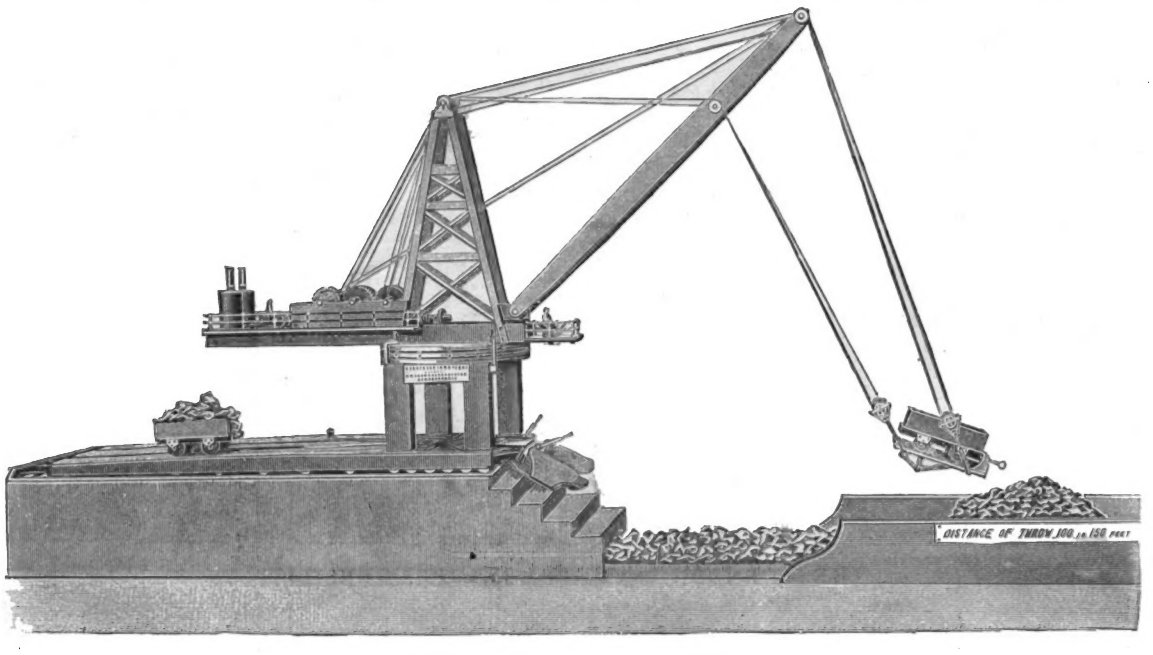
The four escape pipes of the Philadelphia Natural Gas Company, at Thirty-sixth Street, Pittsburg, were lighted up again last week, but with a lower pressure than that of the previous occasion. A story gained currency that Mr. Westinghouse proposed to have the gas lighted with a full pressure of gas. Some of the people who live near the escape pipes heard of it and entered a protest, claiming that the heat of the fire under such a pressure would be so great that it would melt the tar on the gravel roofs of their houses. The protest was entirely unnecessary, as the company at no time had any idea of putting on the full pressure, which would be nearly 200 pounds. Such a pressure is deemed too dangerous to allow it to come into the city. A large crowd of people was gathered on Thirty-sixth Street last night to see the illumination, which was extensive enough to enable a person to read a paper with great facility two miles away. On Wednesday night when the gas was lighted, the pressure was ten pounds. Last night the pressure was only nine pounds.

The pipes where the gas was lighted last night are Station A of the company. The escape pipes are four in number, built like an oil well derrick, and extend to a greater height than the highest derrick. The escaping gas first goes into safety valves, ten inches in diameter. From these they pass into a 24 inch pipe, which extends ten feet into the ground. From this pipe at the depth of ten feet it passes into the four 8-inch escape pipes. The object in having the 24 inch pipe extend so far underground is to get rid of the roaring noise which would accompany the escape under any other circumstances. Every six miles stations similar to that of Station A are established, and two men are constantly on watch to see that the pressure does not go above ten pounds. One of these regulating stations is at Murraysville. If the pressure ever gets above ten pounds, each station is telephoned to at once, and the valves regulated until the pressure is brought down.

THE PENDULUM TITAN SHOWN AT THE INVENTIONS EXHIBITION, LONDON.

We illustrate the "pendulum titan" manufactured by Messrs. Ransomes and Rapier, Ipswich. The apparatus consists primarily of a specially constructed jib crane, mounted on a traveling carriage, to allow of its being moved from place to place. The machine has been designed to perform expeditiously all the mechanical work of constructing walls and breakwaters. For the laying of large quantities of concrete or masses of stone under water in such undertakings, it is of the first importance that the machinery employed shall be capable of dealing efficiently with the large quantities of materials necessarily required. The crane is constructed with a cradle suspended by two pairs of ropes or chains from the jib in such a manner that the cradle, when held up to the foot of the crane, shall be in a horizontal position, so as to allow the trucks being run on to it, and in such a manner that, when released from the foot of the crane, it shall swing forward, and, toward the end of its forward swing, tip endwise to discharge the contents of the truck. The pillar forming the center pivot of the moving body of the crane is fixed in the center of upper girders, forming a pathway for the rollers of the live ring of the crane, and fixed on cross girders supported by machine legs from the floor of the apparatus, the rollers working between the upper girders and similar girders fixed to the under side of the crane body. The moving body is fitted with a jib. The boilers and engines, it will be seen, are mounted on the tail piece, so as to form part of the tail weight. The crane is provided with four winding barrels, each constructed in two parts. The front barrel winds the two front chains, the next barrel winds the two back chains, the other two barrels are for varying the radius of the jib. The barrels are all controlled by worm gearing, the worms being loose on the engine shaft and fixed thereto by means of clutches. The engine shaft is also continued so as to operate the central crane post for working the traveling gear. In the floor of the crane is a small turntable toward which a number of lines of rail converge, there being two lines next the water. The cradle is suspended from the jib by four ropes, the two in front of the cradle being attached to the front of the jib, and the two behind being attached lower down the jib, as shown. The cradle is retained in position on the crane by a strong frame provided with guides. When the cradle has swung out and deposited its load, it swings back again, and a detent on its under side drops into a rack on the frame. The rack is mounted on parallel links, and lowered by means of a handle to release the cradle.

The dimensions of the apparatus are of course determined by the load to be lifted and the distance which it is desired to be thrown, and is so arranged as to admit of considerable variations as regards radius of jib. The chains for effecting this purpose are passed over a high mast, and are so adjusted that the radius of the jib can be varied without altering the height of the suspended load. In this way, when a block has been lowered nearly to its intended place, it can be finally adjusted with great facility. The height of the mast reduces to a minimum the strain on the adjusting jib, and the "fusee" barrel employed so equalizes their travel and the movements of the load chains that the load is neither lifted nor lowered when the radius and height of the jib are altered. The details of the machine have been carefully worked out, and all the structural parts are made of wrought iron.



THE PENDULUM TITAN.

As illustrating its extraordinary capacity for depositing materials, we are informed that the machine can discharge 20 trucks, each containing 10 tons, in half an hour, throwing the contents to a distance of 100 to 150 feet, being equivalent to the removal of 400 tons per hour.

To facilitate the discharge of large pieces, the floors of the trucks can be faced with plate iron, or furnished with rollers permanently mounted, so as to allow the large stones to slide off easily.

The machine is useful for all kinds of work in the construction of breakwaters, and is particularly applicable to the formation of structures consisting of "pele mele" concrete or other blocks.—*Mech. World.*

THE PREHENSILE TAILED COENDOU.

The Havre aquarium has just put on exhibition one of the most curious, and especially one of the rarest, of animals—the prehensile tailed coendou (*Synetheres prehensilis*). It was brought from Venezuela by Mr. Equidazu, the commissary of the steamer Colombie.

Brehm says that never but two have been seen—one of them at the Hamburg zoological garden, and the other at London. The one under consideration, then, would be the third specimen that has been brought alive to Europe.

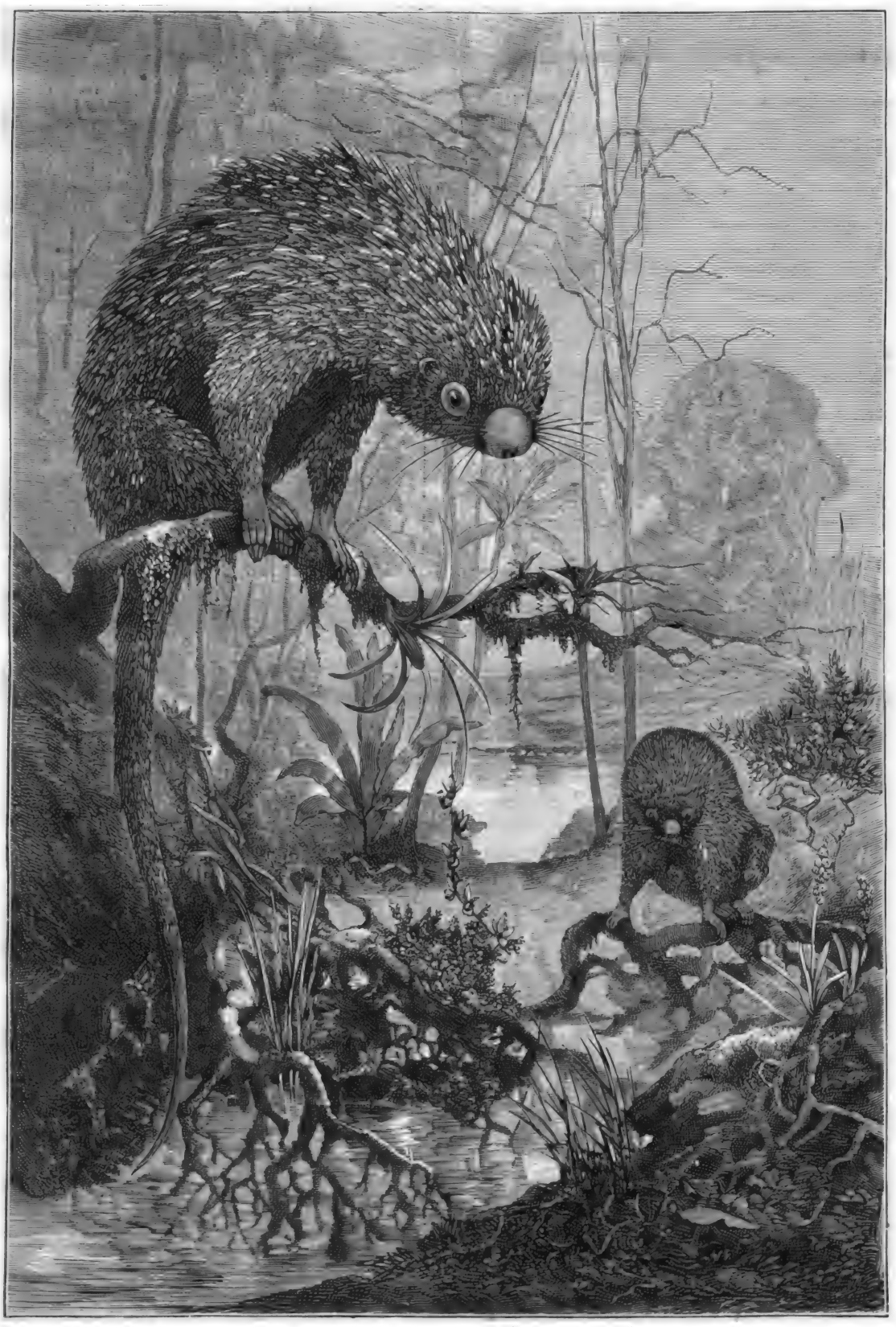
This animal, which is allied to the porcupines, is about three and a half feet long. The tail alone is one and a half feet in length. The entire body, save the belly and paws, is covered with quills which absolutely hide the fur. Upon the back, where these quills are longest (about four inches), they are strong, cylindrical, shining, sharp-pointed, white at the tip and base, and blackish-brown in the middle. The animal, in addition, has long and strong mustaches. The paws, anterior and posterior, have four fingers armed with strong nails, which are curved, and nearly cylindrical at the base.

Very little is known about the habits of the animal. All that we do know is that it passes the day in slumber at the top of a tree, and that it prowls about at night, its food consisting chiefly of leaves of all kinds. When it wishes to descend from one branch to another, it suspends itself by the tail, and lets go of the first only when it has a firm hold of the other.

One peculiarity is that the extremity of the dorsal part of the tail is prehensile. This portion is deprived of quills for a length of about six inches.

The coendou does not like to be disturbed. When it is, it advances toward the intruder and endeavors to frighten him by raising its quills all over its body. The natives of Central America eat its flesh, and employ its quills for various domestic purposes.

The animal is quite extensively distributed throughout South America. It is found in Brazil, Venezuela, Colombia, Guiana, and in some of the Lesser Antilles, such as Trinidad, Barbados, Saint Lucia, etc.—*La Nature.*



THE COENDOU (SYNETHERES PREHENSILIS).

Curious Instance of Assimilation.

A Mr. Cloudman, writing recently from Rondout, N. Y., to the N. Y. *Herald*, suggests the establishment of a chain of lightships across the ocean in the track of the transatlantic liners.

The bare outlines of the project were suggested about two years ago by an English engineer, and the plan was elaborated and developed in the columns of the SCIENTIFIC AMERICAN some months ago. In our article will be found not only every detail that Mr. Cloudman has described in his letter to the *Herald*, but, curiously enough, even the phraseology is the same.

Anisic Acid.

The already long list of new antipyretic remedies has been increased by the addition of anisic acid, a substance obtained from the oil of anise seed. It exists under the form of colorless prismatic crystals, soluble in alcohol and ether. It possesses antipyretic and antiseptic properties similar to those of salicylic acid. It also increases arterial tension. It has, however, a mild toxic effect in large doses, for when it was injected in large quantities into the veins of animals, epileptiform convulsions were caused. It has been employed with success as an antiseptic in the treatment of wounds, and seems, when employed in this way, to exert no poisonous effect.—*Gazzetta Medica.*

The Range of Vision.

In perfectly clear weather the distance from which an object of small size (a man for example) is visible to the naked eye cannot exceed about three and a half miles, when the object is seen in relief against a white background. It may be said that an object is only visible when its movement is perceptible to the naked eye.

From Cape Hode, situated near Havre, it is possible to perceive a fisherman or hunter walking upon the sand banks of the Seine. From the valley of the Grindelwald, in Switzerland, it is possible to see a tourist upon the Jungfrau or Wetterhorn. This distance can be increased by means of a simple opera glass. From the Havre jetty persons may thus be seen, in very clear weather, upon the beach at Trouville, at a distance of eight and a half miles. I say *see*, and not *recognize;* and yet certain fisherwomen of Villerville have found it possible to *recognize* their husbands' boat starting from Havre, at six miles distance. At the last shooting match at Havre, Messrs. Bigot and Pelot each made a series of bull's eyes at nine hundred yards distance—a fact that, besides great skill, supposes a very strong sight.

In tropical seas, captains agree in saying that from the deck of their ships the distance that is visible around them is six leagues. In temperate zones the distance is less. In many cases, the earth's curvature presents an obstacle to the range of vision; and yet this does not always appear to be so. Captain Duclos, of Havre, tells me that once, while becalmed off Madeira, he could not perceive the island during the day, but in the morning and evening observed it at a distance of 22 leagues. Professor Morel, of Paris, informs me that while at Nice, he perceived the profile of the mountains of Corsica, and even made a sketch of it. I myself, while near Dungeness, England, saw houses that were situated in the environs of Boulogne-sur-Mer, France.

In fine weather we cannot see Lion or Luc-sur-Mer from the Havre jetty, and yet there are days when both of these localities become visible. I have found while on a steamer in ordinary weather that the said localities become visible at the middle of the route. On returning, the electric lights of the Havre jetty become visible at the same point. There are, then, days on which, in certain weather, and despite the curvature of the earth, the distance of visibility is doubled or more than doubled.

This phenomenon is explained to us by a well known law of physics. If we throw a coin into an empty vessel, it will be hidden by the edge of the latter, at a certain distance; but if we fill the vessel with water, the coin will become visible. We have here a case of refraction, such as is explained in elementary works on physics.

Every one also knows the theory of the mirage emitted by the celebrated Monge, who explains the phenomenon as due to a diminution of the air's density in contact with the superheated earth. A contrary theory will explain the mirage at sea. While the sun is making the atmosphere intensely hot, the sea and the strata of air in contact therewith remain relatively cold, and these strata become superposed in the order of their density. A luminous ray emanating from the sea will pass from one stratum into another of less density, there will be a refraction, and an object beneath the horizon will be seen above it. This theory supposes two conditions, to wit: A heating of the atmosphere, while the sea and earth remain relatively cold, and a calmness of it to permit its strata to become superposed in the order of their density. It is precisely when these two conditions are fulfilled that the phenomenon of the mirage occurs. On such days, ships rise instead of descending in measure as they recede. As the horizon is perceived by direct visibility, a ship is finally seen above the horizon, as if it were suspended in the air. It is the famous "phantom ship," familiar to sailors—a visible ship in its natural, upright position. If atmospheric conditions were favorable, a second ship would be seen above the first, etc. Certain mariners worthy of credence have assured me that they have seen as many as seven superposed ships.—*Emile Sorel, in La Nature.*

The Ancient and the Modern Ark.

The following figures concerning the Great Eastern and the Ark are of interest. Somebody is comparing the size and cost of the Great Eastern and Noah's Ark. The cost of building and launching the Great Eastern was $3,650,000, and this broke the original company. A new company was formed, which spent $600,000 in fitting and furnishing her. Then this company failed, and a new company was organized, with a capital of $500,000. At the close of 1880 this company sank £86,715 upon the vessel, thus making her total cost $4,703,575. Nothing ever built can stand comparison with the Great Eastern, excepting Noah's Ark, and even this vessel could not match her. The length of the Ark was 300 cubits, her breadth 50 cubits, and her height 30 cubits. The cubit of the Scriptures, according to Bishop Wilkins, was 21·65 in., and, computed into English measurement, the Ark was 547 ft. long, 91 ft. beam, 54·7 ft. depth, and 21,762 tons. The Great Eastern is 680 ft. long, 83 ft. beam, 56 ft. depth, and 28,093 tons measurement. So Noah's Ark is quite overshadowed by the Great Eastern.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. William Emmett, of Logansport, Ind. The drawbar is formed with a weight, and the drawhead has rounded claws and a concave or cam, for causing the drawheads to rotate when the cars are brought together, making an automatic coupling that is not liable to get out of order.

A rail friction clamp has been patented by Mr. William Emmett, of Logansport, Ind. It consists of two clamp bars shaped to fit against the web and top of the base of the rail, these bars having a flat straight base part so made that when the outer edge of the base part rests against the under side of the rail base, the inner edge will be a short distance from the inner side of the rail base, the base having tongues and recesses for locking them together.

A valve gear has been patented by Mr. James B. Quinn, of St. Paul, Minn. It consists of two swinging arms deriving their motion from the wheel shaft, two arms imparting motion to the slide valve and automatically cutting off steam by adjustable dogs placed on segments, and a device for regulating the position of the dogs on the segments, the gear being especially adapted for stern wheel steamers using a high pressure engine on one side and low pressure on the other.

AGRICULTURAL INVENTIONS.

A marking attachment for corn planters has been patented by Mr. William H. Clay, of Paris, Ky. It is pivoted to a swiveled piece, with a device fastened to the seat for locking, and a pivoted movable rope carrier, secured to an inclined frame, so the attachment can be shifted from one side of a corn planter to the other.

MISCELLANEOUS INVENTIONS.

A brake for vehicles has been patented by Mr. John B. Hinton, of San Diego, Cal. It is especially designed for vehicles whose fore wheels turn under the box or bed in a place made for that purpose, and the brake is made to operate by the application of a flexible cable.

An animal poke has been patented by Mr. David F. Sandusky, of McLeansborough, Ill. It is a yoke so made that a lever will act to hit the animal on the nose and cause him to start back as he approaches a fence, but will not interfere with the grazing of the animal wearing it.

A mangle has been patented by Catharine Whitney, of Lawrence, Kan. By this invention large wooden rollers are used for smoothing clothes, there being receptacles for clothes ironed and unironed, and means whereby the weight of these receptacles and their clothes are utilized in the ironing process.

A log boat has been patented by Mr. William A. Dexter, of Dayton, N. Y. It is so made as to accommodate itself by both wheels and runners to hard or soft ground, and thus be drawn easier than boats or sleds not having wheels so arranged, saving labor of men and animals in getting out timber.

An attachment for bedsteads has been patented by Mr. James W. Bowles, of Louisville, Ky. This invention provides a guard board which may be used to separate two or more persons sleeping in a bed, or may be used at the edge of a bed to prevent children and others from falling out.

A freight checking device has been patented by Mr. William B. Thomas, of Athens, Ga. The invention covers a tilting lever and means for connecting it with registering mechanism, the device to be placed on the station platform, and being especially adapted for registering the shipment of cotton bales.

A fastening band for packages of merchandise has been patented by Mr. Samuel W. Page, of Jersey City, N. J. It is flexible, one end being plain and the other having attached a metal clip with clinching prongs, and short hook-shaped sharp teeth for engagement with the plain end.

A fire escape has been patented by Messrs. Robert M. Henderson and John A. Glaesline, of Jackson County, Ind. (P. O., Leesville, Ind.) It is made in sections, adapted to be drawn out so the ladder may be made to reach any desired height, can be operated by one person, and adjusted and set to any required inclination before the sliding portions are raised.

A revolving sweeping attachment for spinning mules has been patented by Mr. Charles Ashworth, of Grosvenor Dale, Conn. It has a sweeping roller so operated as to gather up and retain the sweepings, and form them into a mat or web around the roller, from which the sweepings may be cut, furnishing a compact bat or web.

A radially folding synchronous chart has been patented by Messrs. James M. Ludlow, Isaac K. Funk, and Adam W. Wagnalls. It is made with a series of sector-shaped plates, pivoted and divided into a fan-like arrangement, to constitute historical charts, or so that events for the same century, year, etc., may be readily compared.

Stringing pianos forms the subject of a patent issued to Mr. James F. Conover, of New York city. This invention provides additional pressure strings adjacent to the long covered and plain strings, the additional strings resting on the bridge and exerting a pressure thereon, but not being struck by the hammer, and not sounded.

A boot or shoe has been patented by Mr. Henry W. Joslin, of Titusville, N. J. It is designed to prevent moisture from penetrating the uppers around the edge of the soles, and the invention provides for a strip of waterproof material secured to the outer side of the upper along the edge of the sole at the forward part of the boot or shoe.

A turning machine has been patented by Mr. Albert T. Booth, of Meriden, Conn. This invention covers improvements on a former patented invention of the same inventor, including means for operating and controlling the chuck, whereby it is made to automatically tighten its hold, and may be readily released as desired, while the mechanism is simplified.

A washing machine has been patented by Mr. Samuel Martin, of Hartland, Mich. Combined with a tub is a shaft on which rollers are held, and a pivoted frame in which end rollers are held, over which an endless belt passes, on which transverse ribs are secured, the clothes being rubbed between the rollers and the ribs on the belt.

A fifth wheel attachment has been patented by Mr. Adelbert A. Meyers, of St. Louis, Mo. It consists of a small roller mounted on the end of a spring in position to bear hard against the under side of the movable part of the fifth wheel, the spring and roller being within a casting which acts as the main brace and coupling clip of the running gear.

A clasp for ribbon rolls has been patented by Mr. Edwin W. Raymond, of Coupeville, Washington Ter. It is made of a piece of spring metal folded upon itself to form parallel clasping arms, one arm being bent to form a lip or stop to keep the clasp in place upon the goods and the goods in place upon the roll.

A handle for package carriers has been patented by Carrie C. Boyd, of Fruitport, Mich. It is made with a central part forming a hand grasp, and with opposite ends bent to form three open loops, into which the cord of the package passes when the handle is applied, to facilitate the convenient carriage of packages bound with cord or twine.

A fire escape has been patented by Mr. Thomas D. McKinzie, of Colorado, Tex. It consists of a car and elevator chain, with various novel details, whereby the lowering of the car is made easy, the occupants may be shielded from smoke and flame, the apparatus may be conveniently housed when not in use, and cannot be used by burglars.

An oil drip washer for roller skates has been patented by Mr. Louis Steinberger, of New York city. It is a metallic washer provided with an adjustable and removable fibrous drip, to catch and absorb the oil escaping from the axle and hub, the drip surrounding the edge and extending over a portion of the two surfaces of the washer.

A safe deposit vault has been patented by Mr. Rufus E. Dixon, of New York city. This invention covers a frame with central compartments surrounded by outer ones, in combination with a shell and surrounding masonry, the frame being adapted to revolve in the shell, with other novel features, to afford the most complete protection against fire and burglars.

An apparatus for smelting and calcining lead and other ores has been patented by Mr. Elliott R. Moffet, of Joplin, Mo. It is so made that the fumes from the roaster or calcining furnace are drawn or passed direct into the cupola furnace, and the air supplied to the cupola furnace is heated by the heat from the calcining furnace, with other novel features.

A ribbon reel has been patented by Mr. James E. McMurtrie, of Saxton, Pa. It has opposite slotted frame bars, with inturned and slotted end parts, clamp plates and screws, with other novel features, the device being intended for holding bolts of ribbon, braid, and the like, so that any desired quantity may be reeled off, and the loose end will be held firmly.

A gas pressure regulator has been patented by Mr. Robert F. Hatfield, of New York city. Combined with the inlet pipe, cylinder attached to the float, and cone attached to the inner case of the regulator, are a valve and cylinder rigidly connected with each other and with the cylinder, whereby the descent of the float will wholly prevent the inflow of gas.

An automatic registering machine has been patented by Mr. William H. Barber, of Ward, O. It is made so that an enumerating tape may be transferred back and forth upon separate drums, with transferring rollers having an intermittent movement to carry the enumerating tape a certain distance at every intermittent movement, for use with bagging and weighing devices, etc.

A washing machine has been patented by Mr. Hiram H. Tuttle, of Phœnix, Arizona Ter. This invention covers an improvement in that class of washing machines in which a cylinder clothes carrier is supported and revolved within a steam boiler or case, the cylindrical body having a novel construction, and so the cylinders can be sold separately to be applied to an ordinary boiler or steam case.

A water gate has been patented by Mr. William A. Lovelace, of Lovelaceville, Ky. It is made in two sections, and has hollow posts with openings for the water to lift floats to raise the gate as the water rises, being more especially designed to prevent live stock from trespassing on adjacent lands, while so made as to clear floating substances drifting down stream.

A folding and pasting machine for forming cornucopia paper bags has been patented by Mr. John N. Chadsey, of Valatie, N. Y. This invention covers a novel construction and combination of parts by which the blanks, as fed to the feed rollers, are properly folded for a pasting edge, formed and pasted, and the pasted edges compressed into proper shape to form the bag.

A hot air stove has been patented by Mr. Richard A. Rew, of Pomeroy, Washington Ter. Combined with a cold air supply pipe and a distributing chamber divided into communicating sections by radial partitions, is a stove with inner and outer casings, so that pure air can be taken into the stove, warmed to any desired temperature, and discharged into the apartment to be heated, thus insuring perfect ventilation.

A process of and apparatus for remelting soap form the subject of two patents issued to Mr. John C. Ralston, of Toledo, Ohio. The process consists in subjecting the soap scrap to the action of heat and open steam simultaneously to soften and melt the same, and then subjecting the melted soap to the action of heat to remove the surplus moisture, the apparatus covering a suitable vessel, in its upper part a holder for the scrap, over a system of steam jet pipes, with a steam heating coil below the jet pipes, with other novel features, whereby the superfluous steam is not condensed in the melted soap.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) C. L. W. writes: Can you favor me with a plain explanation of Coddington's method of finding the radii of an achromatic object glass? I have Coddington's book, but it is too deep for me, as I do not understand algebra very well. In the *English Mechanic* for August and September, 1883, there is given an explanation of the method, but I do not understand how it is applied in practice. What I want is plain directions in simple language, and perhaps one or two examples showing how every step is taken, and how the numbers are derived, so that I can work out any example in practice myself. A. The formulas of Coddington and his contemporaries were very imperfect, and not suited to the requirements of late practice. The formulas published in a series of papers in the *English Mechanic* are somewhat better, but still imperfect, because the refractive and dispersive indices of both crown and flint lenses must not only have certain fixed relations as regards each other, for achromatism, but must also have certain relations in composition and density, to obtain correction in spherical aberration coincident with achromatism. These conditions are only fully understood as necessary for practical work by a few successful opticians. Professor Hastings claims to have made computations that led to practical and exact results, but they are not plain, simple, explanations that anybody can follow with all kinds of glass. The character of the glass, both flint and crown, must be an exact factor in any computation. In practice this can only be found by trial. For your consideration we give you the curves of some well known and successful objectives. Clark's 26 inch object glass at the Observatory, Washington (Fig. 1), 1st,

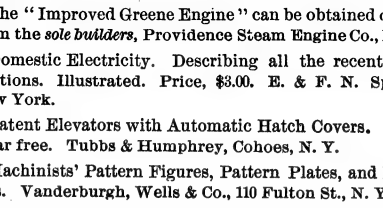


Fig. 1

2d, and 3d surfaces equal curves; 4th surface (flint) slightly convex, and varied to make the final correction. Densities and indices unknown to us. The objective at Princeton, 23 inches diameter (Fig. 2), also by

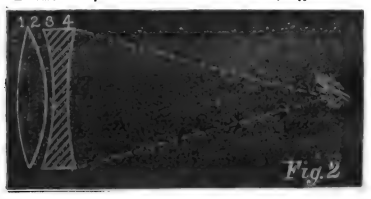


Fig. 2

Clark, is evidently made of glass of quite a different character, as will be seen by comparison of the relative forms of curves:

1st surface..... .....265·8″ rad.
2d " .... 81·9″ "
(both of these convex.)
3d " .... 73·4″ "
4th " .....222·2″ "
(both of these being flint glass concave.)

The lenses set 7½″ apart.

The Hastings object glass (Fig. 3) is reversed, having the

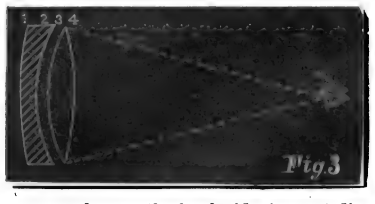


Fig. 3

crown convex lens on the focal side, is 9 4/10″ diameter, and the glasses are set 1/10″ apart, curves as follows:

Flint 1st surface.....121·2 ″ convex.
2d " ..... 34·22″ concave.
Crown 3d " ..... 34·48″ convex.
" 4th " .....108·4 ″ convex.

The density of these glasses is as follows:

Flint 3·516, refractive index 1·615; crown 2·563, refractive index 1·523. Focal distance not known to us, but supposed to be between 9 and 10 feet.

(2) G. H. B. asks a receipt for cheap, substantial gold plate, to use on nickel plated roller skates for exhibition, to apply without the aid of any machine. A. Do not know of any other method than electro-plating that will bear polishing or add to the beauty of nickel plate. A dip solution will be dull, and look more like brass than gold.

(3) H. R. asks: Will you be kind enough to give me a receipt for making soft yellow solder, as I have a number of joints to make, and common soft solder shows too plain, and cannot use hard solder, for the work will not stand to be heated hot enough to melt hard solder? A. We know of no method of making yellow soft solder; you can color the solder, after it has been applied, by means of the colored lacquers.

(4) W. K. L. asks: Of what and how are grindstones made? A. Grindstones are made from natural sandstone, the stones being cut roughly into shape and afterward turned.

(5) W. A. P. writes: 1. I am making the dynamo described in SUPPLEMENT, No. 161, and I have been at a loss to know how to make the armature. Should it (the cast iron part) be like the letter H, and the brass heads fastened to the side pieces? A. The armature should be of very soft gray cast iron of H form, as indicated in your sketch, and shown in the drawings in SUPPLEMENT, No. 161. The brass heads are fastened to the projecting ends of the side piece. 2. Also, what number of SUPPLEMENT has the best working drawings for an electric motor, one about the size of the dynamo in No. 161 SUPPLEMENT? A. You can make the motor from the same drawings, using No. 16 wire on the armature, and fewer layers of wire upon the field magnet, say three or four instead of seven.

(6) W. B. asks: If I take two carbon plates 3x4, and place them in a jar containing a solution of sulphuric acid and bichromate of potash, with a zinc plate of similar size between them, would I get electricity of sufficient electromotive force to run an incandescent lamp, and if so, what number of candle power lamp would six similar cells run? A. Six cells of such a battery as you describe would run a 5 or 6 candle power lamp for a short time. 2. Could I increase the power of the battery by a different relative size of plates? A. You can increase the quantity of current by this means. 3. Would the batteries be constant? A. No; this form of battery, although very powerful and efficient for experimental purposes, is not adapted to continual use, as it soon polarizes. 4. Are magnets made of hardened steel better than those made of common bar steel? A. The steel for magnets must be hardened to render them permanent.

(7) J. C. S.—The affection indicated (pimples on the face) is known in medical works as acne. It is not of the slightest consequence, except that its presence on the face causes annoyance as a disfigurement. It is no indication of ill health, and needs no medicine, unless the digestion be impaired from other causes. Sulphur ointment applied at night and washed away in the morning with abundance of soft soap and warm water helps to improve the looks. The pimples commonly disappear by the age of 20 to 22.

(8) H. L. G. asks: 1. If a supply steam pipe is at the end of a boiler, would it cause the water in the boiler to foam? A. Not necessarily. 2. If the foaming is caused by soap or oil, would I be right to pump soda in the boiler or blow off? A, Yes; pump in a little dissolved soda and blow off, and repeat until the boiler is clean.

(9) A. W. M. asks (1) how to make a Leyden jar. A. Take a thin wide mouthed jar; varnish it with shellac inside and outside; allow the varnish to dry; then take some sheets of tin foil and varnish them with shellac, and as soon as the varnish becomes tacky, apply the varnished surface of the leaf to the varnished surface of the jar, rubbing it down thoroughly over every part to insure perfect adhesion. The jar should be coated over both its inner and outer surfaces to within about one-third of its height from the top. 2. Can a Leyden jar be charged with one of the small magneto-electric machines costing $10.00, or only by frictional electricity developed by a Holtz machine or something similar? Would a frictional machine be difficult to make, and where could I find instructions? A. No; only static or frictional electricity can be used in charging a Leyden jar. A frictional electric machine is easily made, but we advise you to make a Holtz machine or a Wimshurst machine. For a full description of the construction of the Holtz electrical machine consult SUPPLEMENT, Nos. 278, 279, and 282. For a description of the Wimshurst machine consult SUPPLEMENT, No. 359.

(10) M. L. asks: 1. Can a battery of Leclanche cells that have been run out on closed circuit be renewed by being repacked with fresh oxide of manganese, or are the carbons injured as well as the manganese that the cells polarized? A. The oxide of manganese should be renewed, and the porous cells, and the carbon should be soaked in warm water for some time previous to refilling the cells with the oxide of manganese. 2. If by polarization is meant that the fluid next to the carbon is impoverished, and prevents the stronger solution from acting on the carbons, can I not remedy that by punching a hole in the pitch on top of the porous cup, and let all the fluid out (which is chlor. zinc, I believe), and would not a new lot of fluid filter through the cups, and thus renew their strength, provided I strengthened the solution in the outer jars? Or is the manganese useless, or are the pores of the porous cups filled with anything to prevent the passage of the fluid? A. Your remedy would not cure the difficulty. The manganese is rendered worthless by long use in the battery.

(11) M. E. R. desires a method of dyeing fur without injuring the fur or skin. A. Experience is very important in dyeing valuable furs. For brown, tincture of logwood is used. For black, logwood and copperas. For red, ground Brazil wood ½ pound, water 1½ quarts, cochineal ½ ounce; boil the Brazil wood in the water one hour, strain, and add the cochineal; boil 15 minutes.

(12) E. P. M. asks: What preparation or salt of mercury is known as the protosulphate? What other name is it known by? A. It is also known as mercurous sulphate. It is prepared by adding sulphuric acid to a solution of mercurous nitrate. It forms a white crystalline powder, and is but slightly soluble in water.

(13) E. G. asks: Will a turpentine bath soften or bring the surface of carbon paper to life again? If not, what will do it, and how applied? A. It will not. It is probable that you are using a poor quality of paper. It may perhaps be improved by laying between oil sheets.

(14) E. H. C.—There are stringent laws in most of the States prohibiting the sale of kerosene unless it be of proper grade. There is no danger from kerosene if properly handled.

(15) E. F. B.—The attraction of gravitation is greatest at the earth's surface. It is nothing at the center.

(16) H. S. asks what the word antipyrine means. A. Antipyrine is the name given to a recent derivative from coal tar. On account of its similarity to quinine, and its like properties, it has been sold as a substitute for this well known febrifuge.

(17) M. J. desires (1) something that will keep the hair curly, that is, the bangs. A. Use the liquid obtained by boiling, for ten minutes, 1 drachm quince seeds in ½ pint water and straining, or steep 6 ounces gum tragacanth for 30 hours in 1 gallon rose water, stirring frequently; strain through a cloth, and let stand for a few days; then strain again, and work into it 4 drachms oil of rose. 2. Will wearing spectacles that are fastened on the nose reduce the size of the nose? A. They may somewhat modify the form of the nose, but it is improbable that the size will be changed.

(18) J. R. M. writes: The top of the cold air pipe which supplies the air to my furnace is one foot below the level of the floor where the first registers are; and I would like to extend the pipe higher, so as to avoid getting the air so near the surface of the ground. How high can I make it, so as to avoid any danger of the draught carrying the air out of the house instead of into it? A. If the cold air box terminates at the bottom of the hot air chamber of the furnace, there will be no danger of a back draught up the cold air box. You may extend it up as far as required for fresh air.

(19) L. V. would like (1) some simple process of purifying skunk's oil. A. Agitation with charcoal and filtration are the only simple means that we can suggest. 2. Which is best and cheapest as an anodyne for a liniment—chloroform or laudanum? A. Chloroform is probably the cheaper article to use, but laudanum is more satisfactory in its action, and is easy to handle.

(20) E. C. asks why slate forms between the layers of coal. Also, why hydrogen contains more latent heat or produces more intense heat in its flame than any other gas? A. Coal has been formed by the growth and decay of vegetation, in the presence of water, as in our present peat swamps. It was therefore accumulated at the mouths of rivers or in localities subject to floods. These alternations covered long periods of time, and while the swamp or bog was sufficiently above water to support vegetation, coal, or rather the peat from which it is formed, accumulated, and in times of submergence, mechanical sediments, such as sandstones and slates, were deposited on top of the former peat. When the subsidence was greater than usual, and the sea invaded the swamp, limestones were formed. In this manner we account for the immense masses of limestone and sandstone in the coal measures, as well as for the thinner partings of clay and slate. The transition from swamp to lagoon is marked by the coaly shales, mixtures of carbonaceous matter, and mineral sediment. The same process on a smaller scale is now to be seen in several localities in the South. —The heat produced by the chemical combination of two elements is due to the fact that by the impact of the combining molecules, the molecular motion is converted into a rotary or vibratory motion of the molecules of the resulting body, and becomes manifest to us as heat or light. In the combustion of hydrogen, by which two atoms unite with one atom of oxygen to form water, the greatest heat is produced, because the energy of chemical combination, or the immense velocity of molecular impact, produces a corresponding motion of the molecule of water. The energy of the chemical combination between these elements is due to their extreme positions in the electro chemical series, which produces a strong chemical affinity.

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